CAS integration tests regression report
Sympy 1.10.1 under Python 3.10.4 vs. Sympy 1.8 under Python 3.8.8

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1 Summary of regression test table

Table 1: Summary table of regression tests

#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8
1	9	235	0 (not solved)	1 (pass)
2	9	237	0 (not solved)	1 (pass)
3	9	250	-2 (exception) `Exception raised: AttributeError >> 'NoneType' object has no attribute 'primitive'`	1 (pass)
4	10	216	-1 (time out)	1 (pass)
5	13	324	-1 (time out)	1 (pass)
6	13	1075	-1 (time out)	1 (pass)
7	13	1089	-1 (time out)	1 (pass)
8	13	1090	-1 (time out)	1 (pass)
9	13	1287	-1 (time out)	1 (pass)
10	13	1288	-1 (time out)	1 (pass)
11	13	1315	-1 (time out)	1 (pass)
12	13	1366	-1 (time out)	1 (pass)
13	13	1374	-1 (time out)	1 (pass)
14	14	162	-1 (time out)	1 (pass)
15	14	163	-1 (time out)	1 (pass)
16	14	164	-1 (time out)	1 (pass)
17	14	165	-1 (time out)	1 (pass)
18	14	166	-1 (time out)	1 (pass)
19	14	291	-1 (time out)	1 (pass)
20	14	292	-1 (time out)	1 (pass)
21	14	293	-1 (time out)	1 (pass)
22	14	490	-1 (time out)	1 (pass)
23	14	502	-1 (time out)	1 (pass)

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#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8
24	14	514	-1 (time out)	1 (pass)
25	14	836	-1 (time out)	1 (pass)
26	14	850	-1 (time out)	1 (pass)
27	14	908	-1 (time out)	1 (pass)
28	14	1034	-1 (time out)	1 (pass)
29	14	1046	-1 (time out)	1 (pass)
30	14	1047	-1 (time out)	1 (pass)
31	14	1063	-1 (time out)	1 (pass)
32	15	149	-1 (time out)	1 (pass)
33	15	150	-1 (time out)	1 (pass)
34	15	153	-1 (time out)	1 (pass)
35	15	154	-1 (time out)	1 (pass)
36	15	155	-1 (time out)	1 (pass)
37	15	158	-1 (time out)	1 (pass)
38	15	159	-1 (time out)	1 (pass)
39	17	10	-1 (time out)	1 (pass)
40	17	11	-1 (time out)	1 (pass)
41	17	15	-1 (time out)	1 (pass)
42	17	16	-1 (time out)	1 (pass)
43	17	19	-1 (time out)	1 (pass)
44	17	30	-1 (time out)	1 (pass)
45	17	34	-1 (time out)	1 (pass)
46	17	35	-1 (time out)	1 (pass)
47	17	38	-1 (time out)	1 (pass)
48	17	39	-1 (time out)	1 (pass)
49	19	424	-1 (time out)	1 (pass)
50	19	425	-1 (time out)	1 (pass)
51	19	426	-1 (time out)	1 (pass)
52	20	62	-1 (time out)	1 (pass)

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#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8
53	20	63	-1 (time out)	1 (pass)
54	21	46	-1 (time out)	1 (pass)
55	21	48	-1 (time out)	1 (pass)
56	21	49	-1 (time out)	1 (pass)
57	21	50	-1 (time out)	1 (pass)
58	21	51	-1 (time out)	1 (pass)
59	21	53	-1 (time out)	1 (pass)
60	21	228	-1 (time out)	1 (pass)
61	21	237	-1 (time out)	1 (pass)
62	21	335	-1 (time out)	1 (pass)
63	21	340	-1 (time out)	1 (pass)
64	21	539	-1 (time out)	1 (pass)
65	21	613	-1 (time out)	1 (pass)
66	21	626	-1 (time out)	1 (pass)
67	21	1084	0 (not solved)	1 (pass)
68	22	15	-1 (time out)	1 (pass)
69	24	131	-1 (time out)	1 (pass)
70	24	139	-1 (time out)	1 (pass)
71	24	140	-1 (time out)	1 (pass)
72	24	151	-1 (time out)	1 (pass)
73	25	1309	-2 (exception) `Exception raised: SystemError >> excessive stack use: stack is 3655 deep`	1 (pass)
74	25	1314	-2 (exception) `Exception raised: SystemError >> excessive stack use: stack is 3655 deep`	1 (pass)

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#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8

75	25	1760	-2 (exception)
			`Exception raised:`
			`SystemError >> excessive stack use: stack is 3277 deep`
				1 (pass)

76	25	2357	-1 (time out)	1 (pass)
77	25	2366	-1 (time out)	1 (pass)
78	26	18	-1 (time out)	1 (pass)
79	26	167	-1 (time out)	1 (pass)
80	26	290	-1 (time out)	1 (pass)
81	26	352	-1 (time out)	1 (pass)
82	26	355	-1 (time out)	1 (pass)
83	26	362	-1 (time out)	1 (pass)
84	26	365	-1 (time out)	1 (pass)
85	26	369	-1 (time out)	1 (pass)
86	26	371	-1 (time out)	1 (pass)
87	26	372	-1 (time out)	1 (pass)
88	26	373	-1 (time out)	1 (pass)
89	26	374	-1 (time out)	1 (pass)
90	27	46	-1 (time out)	1 (pass)
91	27	47	-1 (time out)	1 (pass)
92	27	48	-1 (time out)	1 (pass)
93	27	49	-1 (time out)	1 (pass)
94	27	111	-1 (time out)	1 (pass)
95	27	115	-1 (time out)	1 (pass)
96	27	769	-1 (time out)	1 (pass)
97	27	774	-1 (time out)	1 (pass)
98	27	777	-1 (time out)	1 (pass)
99	27	1013	-1 (time out)	1 (pass)

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#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8
100	29	72	-1 (time out)	1 (pass)
101	29	129	-1 (time out)	1 (pass)
102	29	130	-1 (time out)	1 (pass)
103	29	131	-1 (time out)	1 (pass)
104	29	132	-1 (time out)	1 (pass)
105	29	150	-1 (time out)	1 (pass)
106	29	229	-1 (time out)	1 (pass)
107	29	245	-1 (time out)	1 (pass)
108	29	255	-1 (time out)	1 (pass)
109	29	261	-1 (time out)	1 (pass)
110	29	263	-1 (time out)	1 (pass)
111	29	265	-1 (time out)	1 (pass)
112	29	268	-1 (time out)	1 (pass)
113	29	269	-1 (time out)	1 (pass)
114	29	403	-1 (time out)	1 (pass)
115	29	404	-1 (time out)	1 (pass)
116	29	405	-1 (time out)	1 (pass)
117	29	406	-1 (time out)	1 (pass)
118	29	407	-1 (time out)	1 (pass)
119	29	491	-1 (time out)	1 (pass)
120	33	255	-1 (time out)	1 (pass)
121	33	256	-1 (time out)	1 (pass)
122	33	275	-1 (time out)	1 (pass)
123	33	486	-1 (time out)	1 (pass)
124	33	487	-1 (time out)	1 (pass)
125	33	1288	-1 (time out)	1 (pass)
126	33	1478	-1 (time out)	1 (pass)
127	33	1479	-1 (time out)	1 (pass)
128	33	1480	-1 (time out)	1 (pass)

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#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8
129	33	1495	-1 (time out)	1 (pass)
130	33	1496	-1 (time out)	1 (pass)
131	33	1526	-1 (time out)	1 (pass)
132	33	1527	-1 (time out)	1 (pass)
133	33	1798	-1 (time out)	1 (pass)
134	33	1863	-1 (time out)	1 (pass)
135	33	1864	-1 (time out)	1 (pass)
136	33	1896	-1 (time out)	1 (pass)
137	33	1897	-1 (time out)	1 (pass)
138	33	2014	-1 (time out)	1 (pass)
139	33	2129	-1 (time out)	1 (pass)
140	33	2130	-1 (time out)	1 (pass)
141	33	2140	-1 (time out)	1 (pass)
142	33	2154	-1 (time out)	1 (pass)
143	33	2201	-1 (time out)	1 (pass)
144	33	2214	-1 (time out)	1 (pass)
145	33	2291	-1 (time out)	1 (pass)
146	34	877	-1 (time out)	1 (pass)
147	34	878	-1 (time out)	1 (pass)
148	34	1123	-1 (time out)	1 (pass)
149	34	1124	-1 (time out)	1 (pass)
150	34	1155	-1 (time out)	1 (pass)
151	34	1308	-1 (time out)	1 (pass)
152	34	1309	-1 (time out)	1 (pass)
153	34	1323	-1 (time out)	1 (pass)
154	34	1346	-1 (time out)	1 (pass)
155	34	1347	-1 (time out)	1 (pass)
156	34	1513	-1 (time out)	1 (pass)
157	34	1522	-1 (time out)	1 (pass)

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#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8
158	34	1524	-1 (time out)	1 (pass)
159	34	1540	-1 (time out)	1 (pass)
160	34	1672	-1 (time out)	1 (pass)
161	34	1685	-1 (time out)	1 (pass)
162	35	65	-1 (time out)	1 (pass)
163	35	66	-1 (time out)	1 (pass)
164	35	67	-1 (time out)	1 (pass)
165	35	267	-1 (time out)	1 (pass)
166	35	529	-1 (time out)	1 (pass)
167	35	604	-1 (time out)	1 (pass)
168	35	794	-1 (time out)	1 (pass)
169	37	3	-1 (time out)	1 (pass)
170	38	58	-1 (time out)	1 (pass)
171	38	67	-1 (time out)	1 (pass)
172	39	853	-1 (time out)	1 (pass)
173	39	861	-1 (time out)	1 (pass)
174	39	868	-1 (time out)	1 (pass)
175	39	870	-1 (time out)	1 (pass)
176	39	883	-1 (time out)	1 (pass)
177	39	892	-1 (time out)	1 (pass)
178	40	259	-1 (time out)	1 (pass)
179	40	266	-1 (time out)	1 (pass)
180	40	273	-1 (time out)	1 (pass)
181	41	102	-1 (time out)	1 (pass)
182	41	109	-1 (time out)	1 (pass)
183	41	126	-1 (time out)	1 (pass)
184	41	127	-1 (time out)	1 (pass)
185	42	27	-1 (time out)	1 (pass)
186	42	43	-1 (time out)	1 (pass)

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#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8
187	43	64	-1 (time out)	1 (pass)
188	43	136	-1 (time out)	1 (pass)
189	43	141	-1 (time out)	1 (pass)
190	46	142	-1 (time out)	1 (pass)
191	46	150	-1 (time out)	1 (pass)
192	46	321	-1 (time out)	1 (pass)
193	46	324	-1 (time out)	1 (pass)
194	46	502	-1 (time out)	1 (pass)
195	46	503	-1 (time out)	1 (pass)
196	46	619	-1 (time out)	1 (pass)
197	46	623	-1 (time out)	1 (pass)
198	46	644	-1 (time out)	1 (pass)
199	46	648	-1 (time out)	1 (pass)
200	48	9	-1 (time out)	1 (pass)
201	50	88	-1 (time out)	1 (pass)
202	50	89	-1 (time out)	1 (pass)
203	50	91	-1 (time out)	1 (pass)
204	50	92	-1 (time out)	1 (pass)
205	50	96	-1 (time out)	1 (pass)
206	50	98	-1 (time out)	1 (pass)
207	51	38	-1 (time out)	1 (pass)
208	52	289	0 (not solved)	1 (pass)
209	52	290	0 (not solved)	1 (pass)
210	52	573	0 (not solved)	1 (pass)
211	52	577	0 (not solved)	1 (pass)
212	52	580	0 (not solved)	1 (pass)
213	52	915	0 (not solved)	1 (pass)
214	57	120	-1 (time out)	1 (pass)
215	57	343	-1 (time out)	1 (pass)

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#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8
216	57	344	-1 (time out)	1 (pass)
217	59	3	-1 (time out)	1 (pass)
218	59	31	-1 (time out)	1 (pass)
219	59	59	-1 (time out)	1 (pass)
220	60	45	-1 (time out)	1 (pass)
221	60	52	-1 (time out)	1 (pass)
222	60	106	-1 (time out)	1 (pass)
223	60	110	-1 (time out)	1 (pass)
224	60	120	-1 (time out)	1 (pass)
225	60	245	-1 (time out)	1 (pass)
226	61	74	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
227	61	75	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
228	64	26	0 (not solved)	1 (pass)
229	106	216	-1 (time out)	1 (pass)
230	113	13	0 (not solved)	1 (pass)
231	141	591	0 (not solved)	1 (pass)
232	144	474	0 (not solved)	1 (pass)
233	173	206	0 (not solved)	1 (pass)
234	196	201	0 (not solved)	1 (pass)
235	199	256	0 (not solved)	1 (pass)
236	199	326	0 (not solved)	1 (pass)
237	199	338	0 (not solved)	1 (pass)

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#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8
238	210	86	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
239	210	89	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
240	210	152	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
241	210	222	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
242	210	255	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
243	210	284	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)

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#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8
244	210	307	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
245	210	330	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
246	210	473	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
247	210	598	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
248	210	675	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
249	210	700	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)

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#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8
250	210	778	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
251	210	835	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
252	210	917	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
253	210	1003	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
254	210	1043	-2 (exception) `Exception raised: SystemError >> excessive stack use: stack is 3005 deep`	1 (pass)
255	210	1049	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)

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#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8
256	210	1259	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
257	210	1276	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
258	210	1331	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
259	210	1387	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
260	210	1455	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
261	210	1587	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)

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#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8
262	210	1657	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of ' Poly' and 'int'`	1 (pass)
263	210	1661	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of ' Poly' and 'int'`	1 (pass)
264	210	1705	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of ' Poly' and 'int'`	1 (pass)
265	210	1820	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of ' Poly' and 'int'`	1 (pass)
266	210	2019	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of ' Poly' and 'int'`	1 (pass)
267	210	2117	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of ' Poly' and 'int'`	1 (pass)

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#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8
268	210	2240	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
269	210	2277	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
270	210	2318	-1 (time out)	1 (pass)
271	210	2344	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
272	210	2398	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
273	210	2405	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
274	210	2423	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)

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#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8
275	210	2508	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
276	210	2569	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
277	210	2570	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
278	210	2671	-1 (time out)	1 (pass)
279	210	2849	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
280	210	2893	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
281	210	2897	-2 (exception) `Exception raised: SystemError >> excessive stack use: stack is 3006 deep`	1 (pass)

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#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8
282	210	2907	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
283	210	3063	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
284	210	3087	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
285	210	3089	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
286	210	3156	-1 (time out)	1 (pass)
287	210	3383	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
288	210	3596	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
289	210	3706	-1 (time out)	1 (pass)

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#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8
290	210	3715	-1 (time out)	1 (pass)
291	210	3737	-2 (exception) `Exception raised: SystemError >> excessive stack use: stack is 6437 deep`	1 (pass)
292	210	3939	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
293	210	4051	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
294	210	4056	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
295	210	4088	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
296	210	4109	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)

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#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8
297	210	4134	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of ' Poly' and 'int'`	1 (pass)
298	210	4177	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of ' Poly' and 'int'`	1 (pass)
299	210	4204	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of ' Poly' and 'int'`	1 (pass)
300	210	4469	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of ' Poly' and 'int'`	1 (pass)
301	210	4629	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of ' Poly' and 'int'`	1 (pass)
302	210	4683	-1 (time out)	1 (pass)
303	210	4944	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of ' Poly' and 'int'`	1 (pass)
304	210	5196	-1 (time out)	1 (pass)

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Table 1 – continued from previous page

#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8
305	210	5357	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
306	210	5388	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
307	210	5539	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
308	210	5630	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
309	210	5647	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
310	210	5655	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)

Continued on next page

Table 1 – continued from previous page

#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8
311	210	5656	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of ' Poly' and 'int'`	1 (pass)
312	210	5688	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of ' Poly' and 'int'`	1 (pass)
313	210	5709	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of ' Poly' and 'int'`	1 (pass)
314	210	5746	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of ' Poly' and 'int'`	1 (pass)
315	210	5929	-1 (time out)	1 (pass)
316	210	5942	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of ' Poly' and 'int'`	1 (pass)
317	210	5958	-1 (time out)	1 (pass)
318	210	5964	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of ' Poly' and 'int'`	1 (pass)

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Table 1 – continued from previous page

#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8
319	210	6025	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
320	210	6249	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
321	210	6406	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
322	210	6477	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
323	210	6591	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
324	210	6634	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)

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Table 1 – continued from previous page

#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8
325	210	6685	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
326	210	6772	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
327	210	6869	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
328	210	7164	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
329	210	7254	-1 (time out)	1 (pass)
330	210	7265	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
331	210	7310	-1 (time out)	1 (pass)
332	210	7313	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)

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Table 1 – continued from previous page

#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8
333	210	7350	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
334	210	7422	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
335	210	7508	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
336	210	7742	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
337	210	7758	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
338	210	7785	-2 (exception) `Exception raised: SystemError >> excessive stack use: stack is 6438 deep`	1 (pass)

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Table 1 – continued from previous page

#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8
339	210	7935	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
340	210	8068	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
341	210	8168	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
342	210	8246	-1 (time out)	1 (pass)
343	210	8247	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
344	210	8305	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
345	210	8314	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)

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Table 1 – continued from previous page

#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8
346	210	8325	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
347	210	8348	-1 (time out)	1 (pass)
348	210	8392	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
349	210	8435	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
350	210	8519	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
351	210	8523	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
352	210	8610	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)

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Table 1 – continued from previous page

#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8
353	210	8617	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
354	210	8620	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
355	210	8793	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
356	210	8800	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
357	210	8869	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
358	210	8893	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)

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Table 1 – continued from previous page

#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8
359	210	8900	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
360	210	9001	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
361	210	9011	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
362	210	9095	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
363	210	9101	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
364	210	9111	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
365	210	9117	-1 (time out)	1 (pass)

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Table 1 – continued from previous page

#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8
366	210	9277	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
367	210	9310	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
368	210	9541	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
369	210	9749	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
370	210	9775	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)
371	210	9947	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)

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Table 1 – continued from previous page

#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8
372	210	10034	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of ' Poly' and 'int'`	1 (pass)
373	210	10123	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of ' Poly' and 'int'`	1 (pass)
374	210	10148	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of ' Poly' and 'int'`	1 (pass)
375	210	10161	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of ' Poly' and 'int'`	1 (pass)
376	210	10182	-1 (time out)	1 (pass)
377	210	10263	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of ' Poly' and 'int'`	1 (pass)
378	210	10318	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of ' Poly' and 'int'`	1 (pass)

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Table 1 – continued from previous page

#	test file #	integral #	Sympy 1.10.1 under Python 3.10.4	Sympy 1.8 under Python 3.8.8
379	210	10323	-2 (exception) `Exception raised: TypeError >> '>' not supported between instances of 'Poly' and 'int'`	1 (pass)

2 Test file number 9

Test folder name:

`test_cases/0_Independent_test_suites/9_Stewart_Problems`

2.1 Problem number 235

$$\int \frac{\sqrt{x}}{-\frac{1}{\sqrt[3]{x}}+\sqrt{x}}\,dx$$

Optimal antiderivative

$$\begin{aligned}
&6x^{\frac{1}{6}}+x+\frac{6\ln\left(1-x^{\frac{1}{6}}\right)}{5}-\frac{3\ln\left(2+x^{\frac{1}{6}}+2x^{\frac{1}{3}}-x^{\frac{1}{6}}\sqrt{5}\right)\left(-\sqrt{5}+1\right)}{10}\\
&-\frac{3\ln\left(2+x^{\frac{1}{6}}+2x^{\frac{1}{3}}+x^{\frac{1}{6}}\sqrt{5}\right)\left(\sqrt{5}+1\right)}{10}\\
&-\frac{3\arctan\left(\frac{\left(1+4x^{\frac{1}{6}}+\sqrt{5}\right)\sqrt{50+10\sqrt{5}}}{20}\right)\sqrt{10-2\sqrt{5}}}{5}\\
&-\frac{3\arctan\left(\frac{1+4x^{\frac{1}{6}}-\sqrt{5}}{\sqrt{10+2\sqrt{5}}}\right)\sqrt{10+2\sqrt{5}}}{5}
\end{aligned}$$

command

```
integrate(x**(1/2)/(-1/x**(1/3)+x**(1/2)),x)
```

Sympy 1.10.1 under Python 3.10.4 output

$$\int \frac{x^{\frac{5}{6}}}{\left(\sqrt[6]{x}-1\right)\left(\sqrt[6]{x}+x^{\frac{2}{3}}+\sqrt[3]{x}+\sqrt{x}+1\right)}\,dx$$

Sympy 1.8 under Python 3.8.8 output

$$6\sqrt[6]{x}+x+\frac{6\log\left(\sqrt[6]{x}-1\right)}{5}-\frac{3\sqrt{5}\,\log\left(8\sqrt[6]{x}+8\sqrt{5}\,\sqrt[6]{x}+16\sqrt[3]{x}+16\right)}{10}$$
$$-\frac{3\log\left(8\sqrt[6]{x}+8\sqrt{5}\,\sqrt[6]{x}+16\sqrt[3]{x}+16\right)}{10}-\frac{3\log\left(-8\sqrt{5}\,\sqrt[6]{x}+8\sqrt[6]{x}+16\sqrt[3]{x}+16\right)}{10}$$
$$+\frac{3\sqrt{5}\,\log\left(-8\sqrt{5}\,\sqrt[6]{x}+8\sqrt[6]{x}+16\sqrt[3]{x}+16\right)}{10}$$
$$-\frac{3\sqrt{2}\,\sqrt{5-\sqrt{5}}\,\operatorname{atan}\left(\frac{2\sqrt{2}\,\sqrt[6]{x}}{\sqrt{5-\sqrt{5}}}+\frac{\sqrt{2}}{2\sqrt{5-\sqrt{5}}}+\frac{\sqrt{10}}{2\sqrt{5-\sqrt{5}}}\right)}{5}$$
$$-\frac{3\sqrt{2}\,\sqrt{\sqrt{5}+5}\,\operatorname{atan}\left(\frac{2\sqrt{2}\,\sqrt[6]{x}}{\sqrt{\sqrt{5}+5}}-\frac{\sqrt{10}}{2\sqrt{\sqrt{5}+5}}+\frac{\sqrt{2}}{2\sqrt{\sqrt{5}+5}}\right)}{5}$$

2.2 Problem number 237

$$\int \frac{1}{\frac{1}{\sqrt[3]{x}}+\frac{1}{\sqrt[4]{x}}}\,dx$$

Optimal antiderivative

$$12x^{\frac{1}{12}}-6x^{\frac{1}{6}}+4x^{\frac{1}{4}}-3x^{\frac{1}{3}}+\frac{12x^{\frac{5}{12}}}{5}+\frac{12x^{\frac{7}{12}}}{7}-\frac{3x^{\frac{2}{3}}}{2}+\frac{4x^{\frac{3}{4}}}{3}-\frac{6x^{\frac{5}{6}}}{5}$$
$$+\frac{12x^{\frac{11}{12}}}{11}-x+\frac{12x^{\frac{13}{12}}}{13}-\frac{6x^{\frac{7}{6}}}{7}+\frac{4x^{\frac{5}{4}}}{5}-12\ln\left(1+x^{\frac{1}{12}}\right)-2\sqrt{x}$$

command

```
integrate(1/(1/x**(1/3)+1/x**(1/4)),x)
```

Sympy 1.10.1 under Python 3.10.4 output

$$\int \frac{x^{\frac{7}{12}}}{\sqrt[4]{x}+\sqrt[3]{x}}\,dx$$

Sympy 1.8 under Python 3.8.8 output

$$\frac{12x^{\frac{13}{12}}}{13}+\frac{12x^{\frac{11}{12}}}{11}+\frac{12x^{\frac{7}{12}}}{7}+\frac{12x^{\frac{5}{12}}}{5}+12\sqrt[12]{x}-\frac{6x^{\frac{7}{6}}}{7}-\frac{6x^{\frac{5}{6}}}{5}-6\sqrt[6]{x}$$
$$+\frac{4x^{\frac{5}{4}}}{5}+\frac{4x^{\frac{3}{4}}}{3}+4\sqrt[4]{x}-\frac{3x^{\frac{2}{3}}}{2}-3\sqrt[3]{x}-2\sqrt{x}-x-12\log\left(\sqrt[12]{x}+1\right)$$

2.3 Problem number 250

$$\int \frac{1}{b\cos(x)+a\sin(x)}\,dx$$

Optimal antiderivative

$$-\frac{\operatorname{arctanh}\left(\frac{a\cos(x)-b\sin(x)}{\sqrt{a^2+b^2}}\right)}{\sqrt{a^2+b^2}}$$

command

```
integrate(1/(b*cos(x)+a*sin(x)),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: AttributeError

Sympy 1.8 under Python 3.8.8 output

$$\begin{cases} \tilde{\infty}\left(-\log\left(\tan\left(\frac{x}{2}\right)-1\right)+\log\left(\tan\left(\frac{x}{2}\right)+1\right)\right) & \text{for } a=0\wedge b=0 \\ \frac{\log\left(\tan\left(\frac{x}{2}\right)\right)}{a} & \text{for } b=0 \\ \frac{1}{b\sin(x)+i\sqrt{b^2}\cos(x)} & \text{for } a=-\sqrt{-b^2} \\ \frac{1}{b\sin(x)-i\sqrt{b^2}\cos(x)} & \text{for } a=\sqrt{-b^2} \\ -\frac{\log\left(-\frac{a}{b}+\tan\left(\frac{x}{2}\right)-\frac{\sqrt{a^2+b^2}}{b}\right)}{\sqrt{a^2+b^2}}+\frac{\log\left(-\frac{a}{b}+\tan\left(\frac{x}{2}\right)+\frac{\sqrt{a^2+b^2}}{b}\right)}{\sqrt{a^2+b^2}} & \text{otherwise} \end{cases}$$

3 Test file number 10

Test folder name:

```
test_cases/0_Independent_test_suites/10_Timofeev_Problems
```

3.1 Problem number 216

$$\int \frac{1}{(1-x)^{7/2}x^5}\,dx$$

Optimal antiderivative

$$\frac{3003}{320\,(1-x)^{\frac{5}{2}}}+\frac{1001}{64\,(1-x)^{\frac{3}{2}}}-\frac{1}{4\,(1-x)^{\frac{5}{2}}\,x^4}-\frac{13}{24\,(1-x)^{\frac{5}{2}}\,x^3}$$
$$-\frac{143}{96\,(1-x)^{\frac{5}{2}}\,x^2}-\frac{429}{64\,(1-x)^{\frac{5}{2}}\,x}-\frac{3003\operatorname{arctanh}\left(\sqrt{1-x}\right)}{64}+\frac{3003}{64\sqrt{1-x}}$$

command

```
integrate(1/(1-x)**(7/2)/x**5,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\begin{cases} -\frac{45045ix^7\operatorname{asin}\left(\frac{1}{\sqrt{x}}\right)}{-960x^7+2880x^6-2880x^5+960x^4}+\frac{45045ix^6\sqrt{x-1}}{-960x^7+2880x^6-2880x^5+960x^4}+\frac{135135ix^6\operatorname{asin}\left(\frac{1}{\sqrt{x}}\right)}{-960x^7+2880x^6-2880x^5+960x^4}-\frac{105105ix^5\sqrt{x-1}}{-960x^7+2880x^6-2880x^5+9} \\ -\frac{45045x^7\log(x)}{-1920x^7+5760x^6-5760x^5+1920x^4}+\frac{90090x^7\log\left(\sqrt{1-x}+1\right)}{-1920x^7+5760x^6-5760x^5+1920x^4}-\frac{45045i\pi x^7}{-1920x^7+5760x^6-5760x^5+1920x^4}+\frac{90090x^6\sqrt{1}}{-1920x^7+5760x^6-5} \end{cases}$$

4 Test file number 13

Test folder name:

```
test_cases/1_Algebraic_functions/1.1_Binomial_products/1.1.1_Linear/13_1.1.1.2-a+b_x-
^m-c+d_x-^n
```

4.1 Problem number 324

$$\int \frac{(a+bx)^{9/2}}{x^8}\,dx$$

Optimal antiderivative

$$-\frac{3b^3(bx+a)^{\frac{3}{2}}}{64x^4}-\frac{3b^2(bx+a)^{\frac{5}{2}}}{40x^5}-\frac{3b(bx+a)^{\frac{7}{2}}}{28x^6}-\frac{(bx+a)^{\frac{9}{2}}}{7x^7}$$
$$-\frac{9b^7\operatorname{arctanh}\left(\frac{\sqrt{bx+a}}{\sqrt{a}}\right)}{1024a^{\frac{5}{2}}}-\frac{3b^4\sqrt{bx+a}}{128x^3}-\frac{3b^5\sqrt{bx+a}}{512a\,x^2}+\frac{9b^6\sqrt{bx+a}}{1024a^2x}$$

command

```
integrate((b*x+a)**(9/2)/x**8,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{a^5}{7\sqrt{b}\,x^{\frac{15}{2}}\sqrt{\frac{a}{bx}+1}}-\frac{23a^4\sqrt{b}}{28x^{\frac{13}{2}}\sqrt{\frac{a}{bx}+1}}-\frac{541a^3b^{\frac{3}{2}}}{280x^{\frac{11}{2}}\sqrt{\frac{a}{bx}+1}}$$
$$-\frac{5249a^2b^{\frac{5}{2}}}{2240x^{\frac{9}{2}}\sqrt{\frac{a}{bx}+1}}-\frac{6653ab^{\frac{7}{2}}}{4480x^{\frac{7}{2}}\sqrt{\frac{a}{bx}+1}}-\frac{1027b^{\frac{9}{2}}}{2560x^{\frac{5}{2}}\sqrt{\frac{a}{bx}+1}}$$
$$+\frac{3b^{\frac{11}{2}}}{1024ax^{\frac{3}{2}}\sqrt{\frac{a}{bx}+1}}+\frac{9b^{\frac{13}{2}}}{1024a^2\sqrt{x}\,\sqrt{\frac{a}{bx}+1}}-\frac{9b^7\operatorname{asinh}\left(\frac{\sqrt{a}}{\sqrt{b}\,\sqrt{x}}\right)}{1024a^{\frac{5}{2}}}$$

4.2 Problem number 1075

$$\int (1-x)^{9/2}(1+x)^{3/2}\,dx$$

Optimal antiderivative

$$\frac{3(1-x)^{\frac{3}{2}}x(1+x)^{\frac{3}{2}}}{8}+\frac{3(1-x)^{\frac{5}{2}}(1+x)^{\frac{5}{2}}}{10}+\frac{3(1-x)^{\frac{7}{2}}(1+x)^{\frac{5}{2}}}{14}$$
$$+\frac{(1-x)^{\frac{9}{2}}(1+x)^{\frac{5}{2}}}{7}+\frac{9\arcsin(x)}{16}+\frac{9x\sqrt{1-x}\,\sqrt{1+x}}{16}$$

command

```
integrate((1-x)**(9/2)*(1+x)**(3/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\begin{cases}-\frac{9i\operatorname{acosh}\left(\frac{\sqrt{2}\,\sqrt{x+1}}{2}\right)}{8}+\frac{i(x+1)^{\frac{15}{2}}}{7\sqrt{x-1}}-\frac{23i(x+1)^{\frac{13}{2}}}{14\sqrt{x-1}}+\frac{541i(x+1)^{\frac{11}{2}}}{70\sqrt{x-1}}-\frac{5249i(x+1)^{\frac{9}{2}}}{280\sqrt{x-1}}+\frac{6653i(x+1)^{\frac{7}{2}}}{280\sqrt{x-1}}-\frac{1027i(x+1)^{\frac{5}{2}}}{80\sqrt{x-1}}-\frac{3i}{16\sqrt{}} \\ \frac{9\operatorname{asin}\left(\frac{\sqrt{2}\,\sqrt{x+1}}{2}\right)}{8}-\frac{(x+1)^{\frac{15}{2}}}{7\sqrt{1-x}}+\frac{23(x+1)^{\frac{13}{2}}}{14\sqrt{1-x}}-\frac{541(x+1)^{\frac{11}{2}}}{70\sqrt{1-x}}+\frac{5249(x+1)^{\frac{9}{2}}}{280\sqrt{1-x}}-\frac{6653(x+1)^{\frac{7}{2}}}{280\sqrt{1-x}}+\frac{1027(x+1)^{\frac{5}{2}}}{80\sqrt{1-x}}+\frac{3(x+1)}{16\sqrt{1-}}\end{cases}$$

4.3 Problem number 1089

$$\int (1-x)^{9/2}(1+x)^{5/2}\,dx$$

Optimal antiderivative

$$\frac{15(1-x)^{\frac{3}{2}}\,x(1+x)^{\frac{3}{2}}}{64}+\frac{3(1-x)^{\frac{5}{2}}\,x(1+x)^{\frac{5}{2}}}{16}+\frac{9(1-x)^{\frac{7}{2}}\,(1+x)^{\frac{7}{2}}}{56}$$
$$+\frac{(1-x)^{\frac{9}{2}}\,(1+x)^{\frac{7}{2}}}{8}+\frac{45\arcsin(x)}{128}+\frac{45x\sqrt{1-x}\,\sqrt{1+x}}{128}$$

command

```
integrate((1-x)**(9/2)*(1+x)**(5/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\begin{cases}-\frac{45i\,\operatorname{acosh}\left(\frac{\sqrt{2}\,\sqrt{x+1}}{2}\right)}{64}+\frac{i(x+1)^{\frac{17}{2}}}{8\sqrt{x-1}}-\frac{79i(x+1)^{\frac{15}{2}}}{56\sqrt{x-1}}+\frac{725i(x+1)^{\frac{13}{2}}}{112\sqrt{x-1}}-\frac{1699i(x+1)^{\frac{11}{2}}}{112\sqrt{x-1}}+\frac{8191i(x+1)^{\frac{9}{2}}}{448\sqrt{x-1}}-\frac{4099i(x+1)^{\frac{7}{2}}}{448\sqrt{x-1}}-\\ \frac{45\,\operatorname{asin}\left(\frac{\sqrt{2}\,\sqrt{x+1}}{2}\right)}{64}-\frac{(x+1)^{\frac{17}{2}}}{8\sqrt{1-x}}+\frac{79(x+1)^{\frac{15}{2}}}{56\sqrt{1-x}}-\frac{725(x+1)^{\frac{13}{2}}}{112\sqrt{1-x}}+\frac{1699(x+1)^{\frac{11}{2}}}{112\sqrt{1-x}}-\frac{8191(x+1)^{\frac{9}{2}}}{448\sqrt{1-x}}+\frac{4099(x+1)^{\frac{7}{2}}}{448\sqrt{1-x}}+\frac{3(x}{128\sqrt{}}\end{cases}$$

4.4 Problem number 1090

$$\int (1-x)^{7/2}(1+x)^{5/2}\,dx$$

Optimal antiderivative

$$\frac{5(1-x)^{\frac{3}{2}}\,x(1+x)^{\frac{3}{2}}}{24}+\frac{(1-x)^{\frac{5}{2}}\,x(1+x)^{\frac{5}{2}}}{6}+\frac{(1-x)^{\frac{7}{2}}\,(1+x)^{\frac{7}{2}}}{7}+\frac{5\arcsin(x)}{16}+\frac{5x\sqrt{1-x}\,\sqrt{1+x}}{16}$$

command

```
integrate((1-x)**(7/2)*(1+x)**(5/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\begin{cases} -\dfrac{5i\operatorname{acosh}\left(\frac{\sqrt{2}\sqrt{x+1}}{2}\right)}{8} - \dfrac{i(x+1)^{\frac{15}{2}}}{7\sqrt{x-1}} + \dfrac{55i(x+1)^{\frac{13}{2}}}{42\sqrt{x-1}} - \dfrac{193i(x+1)^{\frac{11}{2}}}{42\sqrt{x-1}} + \dfrac{1237i(x+1)^{\frac{9}{2}}}{168\sqrt{x-1}} - \dfrac{769i(x+1)^{\frac{7}{2}}}{168\sqrt{x-1}} - \dfrac{i(x+1)^{\frac{5}{2}}}{48\sqrt{x-1}} - \dfrac{5i(}{48\sqrt{} \\ \dfrac{5\operatorname{asin}\left(\frac{\sqrt{2}\sqrt{x+1}}{2}\right)}{8} + \dfrac{(x+1)^{\frac{15}{2}}}{7\sqrt{1-x}} - \dfrac{55(x+1)^{\frac{13}{2}}}{42\sqrt{1-x}} + \dfrac{193(x+1)^{\frac{11}{2}}}{42\sqrt{1-x}} - \dfrac{1237(x+1)^{\frac{9}{2}}}{168\sqrt{1-x}} + \dfrac{769(x+1)^{\frac{7}{2}}}{168\sqrt{1-x}} + \dfrac{(x+1)^{\frac{5}{2}}}{48\sqrt{1-x}} + \dfrac{5(x+1)}{48\sqrt{1-} \end{cases}$$

4.5 Problem number 1287

$$\int \frac{(c+dx)^7}{(a+bx)^5}\,dx$$

Optimal antiderivative

$$\frac{21d^5(-ad+bc)^2x}{b^7} - \frac{(-ad+bc)^7}{4b^8(bx+a)^4} - \frac{7d(-ad+bc)^6}{3b^8(bx+a)^3} - \frac{21d^2(-ad+bc)^5}{2b^8(bx+a)^2} - \frac{35d^3(-ad+bc)^4}{b^8(bx+a)} + \frac{7d^6(-ad+bc)(bx+a)^2}{2b^8} + \frac{d^7(bx+a)^3}{3b^8} + \frac{35d^4(-ad+bc)^3\ln(bx+a)}{b^8}$$

command

```
integrate((d*x+c)**7/(b*x+a)**5,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$x^2\left(-\frac{5ad^7}{2b^6} + \frac{7cd^6}{2b^5}\right) + x\left(\frac{15a^2d^7}{b^7} - \frac{35acd^6}{b^6} + \frac{21c^2d^5}{b^5}\right) + \frac{-319a^7d^7 + 1197a^6bcd^6 - 1617a^5b^2c^2d^5 + 875a^4b^3c^3d^4 - 105a^3b^4c^4d^3 - 21a^2b^5c^5d^2 - 7ab^6c^6d - 3b^7c^7 + x^3(-42}{}$$

$$+ \frac{d^7x^3}{3b^5} - \frac{35d^4(ad-bc)^3\log(a+bx)}{b^8}$$

4.6 Problem number 1288

$$\int \frac{(c+dx)^7}{(a+bx)^6}\,dx$$

Optimal antiderivative

$$\frac{d^6(-6ad+7bc)\,x}{b^7}+\frac{d^7x^2}{2b^6}-\frac{(-ad+bc)^7}{5b^8\,(bx+a)^5}-\frac{7d(-ad+bc)^6}{4b^8\,(bx+a)^4}-\frac{7d^2(-ad+bc)^5}{b^8\,(bx+a)^3}$$
$$-\frac{35d^3(-ad+bc)^4}{2b^8\,(bx+a)^2}-\frac{35d^4(-ad+bc)^3}{b^8\,(bx+a)}+\frac{21d^5(-ad+bc)^2\ln(bx+a)}{b^8}$$

command

```
integrate((d*x+c)**7/(b*x+a)**6,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$x\left(-\frac{6ad^7}{b^7}+\frac{7cd^6}{b^6}\right)$$
$$+\frac{459a^7d^7-1218a^6bcd^6+959a^5b^2c^2d^5-140a^4b^3c^3d^4-35a^3b^4c^4d^3-14a^2b^5c^5d^2-7ab^6c^6d-4b^7c^7+x^4\left(700a^3b^4d\right.}{}$$
$$+\frac{d^7x^2}{2b^6}+\frac{21d^5(ad-bc)^2\log(a+bx)}{b^8}$$

4.7 Problem number 1315

$$\int \frac{(c+dx)^{10}}{(a+bx)^4}\,dx$$

Optimal antiderivative

$$\frac{210d^4(-ad+bc)^6\,x}{b^{10}}-\frac{(-ad+bc)^{10}}{3b^{11}\,(bx+a)^3}-\frac{5d(-ad+bc)^9}{b^{11}\,(bx+a)^2}-\frac{45d^2(-ad+bc)^8}{b^{11}\,(bx+a)}$$
$$+\frac{126d^5(-ad+bc)^5\,(bx+a)^2}{b^{11}}+\frac{70d^6(-ad+bc)^4\,(bx+a)^3}{b^{11}}$$
$$+\frac{30d^7(-ad+bc)^3\,(bx+a)^4}{b^{11}}+\frac{9d^8(-ad+bc)^2\,(bx+a)^5}{b^{11}}$$
$$+\frac{5d^9(-ad+bc)\,(bx+a)^6}{3b^{11}}+\frac{d^{10}(bx+a)^7}{7b^{11}}+\frac{120d^3(-ad+bc)^7\ln(bx+a)}{b^{11}}$$

command

```
integrate((d*x+c)**10/(b*x+a)**4,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$x^6\left(-\frac{2ad^{10}}{3b^5}+\frac{5cd^9}{3b^4}\right)+x^5\left(\frac{2a^2d^{10}}{b^6}-\frac{8acd^9}{b^5}+\frac{9c^2d^8}{b^4}\right)+x^4\left(-\frac{5a^3d^{10}}{b^7}+\frac{25a^2cd^9}{b^6}-\frac{45ac^2d^8}{b^5}+\frac{30c^3d^7}{b^4}\right)$$
$$+x^3\left(\frac{35a^4d^{10}}{3b^8}-\frac{200a^3cd^9}{3b^7}+\frac{150a^2c^2d^8}{b^6}-\frac{160ac^3d^7}{b^5}+\frac{70c^4d^6}{b^4}\right)$$
$$+x^2\left(-\frac{28a^5d^{10}}{b^9}+\frac{175a^4cd^9}{b^8}-\frac{450a^3c^2d^8}{b^7}+\frac{600a^2c^3d^7}{b^6}-\frac{420ac^4d^6}{b^5}+\frac{126c^5d^5}{b^4}\right)$$
$$+x\left(\frac{84a^6d^{10}}{b^{10}}-\frac{560a^5cd^9}{b^9}+\frac{1575a^4c^2d^8}{b^8}-\frac{2400a^3c^3d^7}{b^7}+\frac{2100a^2c^4d^6}{b^6}-\frac{1008ac^5d^5}{b^5}+\frac{210c^6d^4}{b^4}\right)$$
$$+\frac{-121a^{10}d^{10}+955a^9bcd^9-3285a^8b^2c^2d^8+6420a^7b^3c^3d^7-7770a^6b^4c^4d^6+5922a^5b^5c^5d^5-2730a^4b^6c^6d^4+660a^}{}$$
$$+\frac{d^{10}x^7}{7b^4}-\frac{120d^3(ad-bc)^7\log(a+bx)}{b^{11}}$$

4.8 Problem number 1366

$$\int \frac{(a+bx)^5}{(c+dx)^8}\,dx$$

Optimal antiderivative

$$\frac{(bx+a)^6}{7(-ad+bc)(dx+c)^7}+\frac{b(bx+a)^6}{42(-ad+bc)^2(dx+c)^6}$$

command

```
integrate((b*x+a)**5/(d*x+c)**8,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-6a^5d^5-5a^4bcd^4-4a^3b^2c^2d^3-3a^2b^3c^3d^2-2ab^4c^4d-b^5c^5-21b^5d^5x^5+x^4\left(-70ab^4d^5-35b^5cd^4\right)+x^3\left(-105a^2b^}{42c^7d^6+294c^6d^7x+882c^5d^8x^2+}$$

4.9 Problem number 1374

$$\int \frac{1}{(a+bx)^3(c+dx)^8}\,dx$$

Optimal antiderivative

$$\begin{aligned}
&-\frac{b^7}{2\left(-ad+bc\right)^8\left(bx+a\right)^2}+\frac{8b^7d}{\left(-ad+bc\right)^9\left(bx+a\right)}+\frac{d^2}{7\left(-ad+bc\right)^3\left(dx+c\right)^7}\\
&+\frac{b\,d^2}{2\left(-ad+bc\right)^4\left(dx+c\right)^6}+\frac{6b^2d^2}{5\left(-ad+bc\right)^5\left(dx+c\right)^5}+\frac{5b^3d^2}{2\left(-ad+bc\right)^6\left(dx+c\right)^4}\\
&+\frac{5b^4d^2}{\left(-ad+bc\right)^7\left(dx+c\right)^3}+\frac{21b^5d^2}{2\left(-ad+bc\right)^8\left(dx+c\right)^2}\\
&+\frac{28b^6d^2}{\left(-ad+bc\right)^9\left(dx+c\right)}+\frac{36b^7d^2\ln(bx+a)}{\left(-ad+bc\right)^{10}}-\frac{36b^7d^2\ln(dx+c)}{\left(-ad+bc\right)^{10}}
\end{aligned}$$

command

```
integrate(1/(b*x+a)**3/(d*x+c)**8,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

output too large to display

5 Test file number 14

Test folder name:

```
test_cases/1_Algebraic_functions/1.1_Binomial_products/1.1.1_Linear/14_1.1.1.3-a+b_x-^m-c+d_x-^n-e+f_x-^p
```

5.1 Problem number 162

$$\int \frac{(a+bx)^{10}(A+Bx)}{x^{15}}\,dx$$

Optimal antiderivative

$$-\frac{A(bx+a)^{11}}{14a\,x^{14}}+\frac{(3Ab-14aB)\,(bx+a)^{11}}{182a^2x^{13}}-\frac{b(3Ab-14aB)\,(bx+a)^{11}}{1092a^3x^{12}}+\frac{b^2(3Ab-14aB)\,(bx+a)^{11}}{12012a^4x^{11}}$$

command

```
integrate((b*x+a)**10*(B*x+A)/x**15,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-858Aa^{10}-4004Bb^{10}x^{11}+x^{10}\left(-3003Ab^{10}-30030Bab^{9}\right)+x^{9}\left(-24024Aab^{9}-108108Ba^{2}b^{8}\right)+x^{8}\left(-90090Aa^{2}b\right.}{}$$

5.2 Problem number 163

$$\int \frac{(a+bx)^{10}(A+Bx)}{x^{16}}\,dx$$

Optimal antiderivative

$$-\frac{A(bx+a)^{11}}{15a\,x^{15}}+\frac{(4Ab-15aB)\,(bx+a)^{11}}{210a^{2}x^{14}}-\frac{b(4Ab-15aB)\,(bx+a)^{11}}{910a^{3}x^{13}}$$
$$+\frac{b^{2}(4Ab-15aB)\,(bx+a)^{11}}{5460a^{4}x^{12}}-\frac{b^{3}(4Ab-15aB)\,(bx+a)^{11}}{60060a^{5}x^{11}}$$

command

```
integrate((b*x+a)**10*(B*x+A)/x**16,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-4004Aa^{10}-15015Bb^{10}x^{11}+x^{10}\left(-12012Ab^{10}-120120Bab^{9}\right)+x^{9}\left(-100100Aab^{9}-450450Ba^{2}b^{8}\right)+x^{8}\left(-3861\right.}{}$$

5.3 Problem number 164

$$\int \frac{(a+bx)^{10}(A+Bx)}{x^{17}}\,dx$$

Optimal antiderivative

$$-\frac{A(bx+a)^{11}}{16a\,x^{16}}+\frac{(5Ab-16aB)\,(bx+a)^{11}}{240a^{2}x^{15}}-\frac{b(5Ab-16aB)\,(bx+a)^{11}}{840a^{3}x^{14}}$$
$$+\frac{b^{2}(5Ab-16aB)\,(bx+a)^{11}}{3640a^{4}x^{13}}-\frac{b^{3}(5Ab-16aB)\,(bx+a)^{11}}{21840a^{5}x^{12}}+\frac{b^{4}(5Ab-16aB)\,(bx+a)^{11}}{240240a^{6}x^{11}}$$

command

```
integrate((b*x+a)**10*(B*x+A)/x**17,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-15015Aa^{10} - 48048Bb^{10}x^{11} + x^{10}\left(-40040Ab^{10} - 400400Bab^{9}\right) + x^{9}\left(-343200Aab^{9} - 1544400Ba^{2}b^{8}\right) + x^{8}\left(-13}$$

5.4 Problem number 165

$$\int \frac{(a+bx)^{10}(A+Bx)}{x^{18}}\,dx$$

Optimal antiderivative

$$\begin{aligned}
&-\frac{A(bx+a)^{11}}{17a\,x^{17}} + \frac{(6Ab-17aB)\,(bx+a)^{11}}{272a^{2}x^{16}} - \frac{b(6Ab-17aB)\,(bx+a)^{11}}{816a^{3}x^{15}} \\
&+ \frac{b^{2}(6Ab-17aB)\,(bx+a)^{11}}{2856a^{4}x^{14}} - \frac{b^{3}(6Ab-17aB)\,(bx+a)^{11}}{12376a^{5}x^{13}} \\
&+ \frac{b^{4}(6Ab-17aB)\,(bx+a)^{11}}{74256a^{6}x^{12}} - \frac{b^{5}(6Ab-17aB)\,(bx+a)^{11}}{816816a^{7}x^{11}}
\end{aligned}$$

command

```
integrate((b*x+a)**10*(B*x+A)/x**18,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-48048Aa^{10} - 136136Bb^{10}x^{11} + x^{10}\left(-116688Ab^{10} - 1166880Bab^{9}\right) + x^{9}\left(-1021020Aab^{9} - 4594590Ba^{2}b^{8}\right) + x^{8}($$

5.5 Problem number 166

$$\int \frac{(a+bx)^{10}(A+Bx)}{x^{19}}\,dx$$

Optimal antiderivative

$$-\frac{a^{10}A}{18x^{18}}-\frac{a^9(10Ab+aB)}{17x^{17}}-\frac{5a^8b(9Ab+2aB)}{16x^{16}}-\frac{a^7b^2(8Ab+3aB)}{x^{15}}$$
$$-\frac{15a^6b^3(7Ab+4aB)}{7x^{14}}-\frac{42a^5b^4(6Ab+5aB)}{13x^{13}}-\frac{7a^4b^5(5Ab+6aB)}{2x^{12}}-\frac{30a^3b^6(4Ab+7aB)}{11x^{11}}$$
$$-\frac{3a^2b^7(3Ab+8aB)}{2x^{10}}-\frac{5a\,b^8(2Ab+9aB)}{9x^9}-\frac{b^9(Ab+10aB)}{8x^8}-\frac{b^{10}B}{7x^7}$$

command

```
integrate((b*x+a)**10*(B*x+A)/x**19,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-136136Aa^{10}-350064Bb^{10}x^{11}+x^{10}\left(-306306Ab^{10}-3063060Bab^9\right)+x^9\left(-2722720Aab^9-12252240Ba^2b^8\right)+x}{}$$

5.6 Problem number 291

$$\int \frac{x^6}{(a+bx)^2(c+dx)^3}\,dx$$

Optimal antiderivative

$$-\frac{(2ad+3bc)\,x}{b^3d^4}+\frac{x^2}{2b^2d^3}-\frac{a^6}{b^4\left(-ad+bc\right)^3(bx+a)}-\frac{c^6}{2d^5\left(-ad+bc\right)^2(dx+c)^2}$$
$$+\frac{2c^5(-3ad+2bc)}{d^5\left(-ad+bc\right)^3(dx+c)}-\frac{3a^5(-ad+2bc)\ln(bx+a)}{b^4\left(-ad+bc\right)^4}+\frac{3c^4\left(5a^2d^2-6abcd+2b^2c^2\right)\ln(dx+c)}{d^5\left(-ad+bc\right)^4}$$

command

```
integrate(x**6/(b*x+a)**2/(d*x+c)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{3a^5(ad-2bc)\log\left(x+\frac{\frac{3a^{10}d^9(ad-2bc)}{b(ad-bc)^4}-\frac{15a^9cd^8(ad-2bc)}{(ad-bc)^4}+\frac{30a^8bc^2d^7(ad-2bc)}{(ad-bc)^4}-\frac{30a^7b^2c^3d^6(ad-2bc)}{(ad-bc)^4}+\frac{15a^6b^3c^4d^5(ad-2bc)}{(ad-bc)^4}+3a^6cd^5-\frac{3a^5b^4c^5d^4}{(ad-}{3a^6d^6-6a^5bcd^5-15a^2b^4c^4d^2+18ab^5c^5d-6b^6c^6}\right)}{b^4\left(ad-bc\right)^4}$$

$$+\frac{3c^4\left(5a^2d^2-6abcd+2b^2c^2\right)\log\left(x+\frac{3a^6cd^5+\frac{3a^5b^3c^4d^4\left(5a^2d^2-6abcd+2b^2c^2\right)}{(ad-bc)^4}-6a^5bc^2d^4-\frac{15a^4b^4c^5d^3\left(5a^2d^2-6abcd+2b^2c^2\right)}{(ad-bc)^4}+\frac{30a^3b^5c^6d}{d^5\left(}\right.}{}$$

$$+x\left(-\frac{2a}{b^3d^3}-\frac{3c}{b^2d^4}\right)$$

$$+\frac{2a^6c^2d^5+11a^2b^4c^6d-7ab^5c^7+x^2\left(2a^6d^7+12ab^5c^5d^2-\right.}{2a^4b^4c^2d^8-6a^3b^5c^3d^7+6a^2b^6c^4d^6-2ab^7c^5d^5+x^3\left(2a^3b^5d^{10}-6a^2b^6cd^9+6ab^7c^2d^8-2b^8c^3d^7\right)+x^2\left(2a^4b^4d^{10}-\right.}$$

$$+\frac{x^2}{2b^2d^3}$$

5.7 Problem number 292

$$\int \frac{x^5}{(a+bx)^2(c+dx)^3}\,dx$$

Optimal antiderivative

$$\frac{x}{b^2d^3}+\frac{a^5}{b^3\left(-ad+bc\right)^3(bx+a)}+\frac{c^5}{2d^4\left(-ad+bc\right)^2(dx+c)^2}-\frac{c^4(-5ad+3bc)}{d^4\left(-ad+bc\right)^3(dx+c)}$$
$$+\frac{a^4(-2ad+5bc)\ln(bx+a)}{b^3\left(-ad+bc\right)^4}-\frac{c^3\left(10a^2d^2-10abcd+3b^2c^2\right)\ln(dx+c)}{d^4\left(-ad+bc\right)^4}$$

command

```
integrate(x**5/(b*x+a)**2/(d*x+c)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{a^4(2ad-5bc)\log\left(x+\frac{\frac{a^9d^8(2ad-5bc)}{b(ad-bc)^4}-\frac{5a^8cd^7(2ad-5bc)}{(ad-bc)^4}+\frac{10a^7bc^2d^6(2ad-5bc)}{(ad-bc)^4}-\frac{10a^6b^2c^3d^5(2ad-5bc)}{(ad-bc)^4}+\frac{5a^5b^3c^4d^4(2ad-5bc)}{(ad-bc)^4}+2a^5cd^4-\frac{a^4b^4c^5}{(}}{2a^5d^5-5a^4bcd^4-10a^2b^3c^3d^2+10ab^4c^4d-3b^5c^5}\right)}{b^3\left(ad-bc\right)^4}$$

$$-\frac{c^3\left(10a^2d^2-10abcd+3b^2c^2\right)\log\left(x+\frac{\frac{a^5b^2c^3d^4\left(10a^2d^2-10abcd+3b^2c^2\right)}{(ad-bc)^4}+2a^5cd^4-\frac{5a^4b^3c^4d^3\left(10a^2d^2-10abcd+3b^2c^2\right)}{(ad-bc)^4}-5a^4bc^2d^3+\frac{10a^3b}{}}{}\right)}{}$$

$$+\frac{-2a^5c^2d^4-9a^2b^3c^5d+5ab^4c^6+x^2\left(-2a^5d^6-10ab^4c^4d^2+}{2a^4b^3c^2d^7-6a^3b^4c^3d^6+6a^2b^5c^4d^5-2ab^6c^5d^4+x^3\left(2a^3b^4d^9-6a^2b^5cd^8+6ab^6c^2d^7-2b^7c^3d^6\right)+x^2\left(2a^4b^3d^9-2}$$

$$+\frac{x}{b^2d^3}$$

5.8 Problem number 293

$$\int \frac{x^4}{(a+bx)^2(c+dx)^3}\,dx$$

Optimal antiderivative

$$-\frac{a^4}{b^2\left(-ad+bc\right)^3(bx+a)}-\frac{c^4}{2d^3\left(-ad+bc\right)^2(dx+c)^2}+\frac{2c^3(-2ad+bc)}{d^3\left(-ad+bc\right)^3(dx+c)}$$
$$-\frac{a^3(-ad+4bc)\ln(bx+a)}{b^2\left(-ad+bc\right)^4}+\frac{c^2\left(6a^2d^2-4abcd+b^2c^2\right)\ln(dx+c)}{d^3\left(-ad+bc\right)^4}$$

command

```
integrate(x**4/(b*x+a)**2/(d*x+c)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{a^3(ad-4bc)\log\left(x+\frac{\frac{a^8d^7(ad-4bc)}{b(ad-bc)^4}-\frac{5a^7cd^6(ad-4bc)}{(ad-bc)^4}+\frac{10a^6bc^2d^5(ad-4bc)}{(ad-bc)^4}-\frac{10a^5b^2c^3d^4(ad-4bc)}{(ad-bc)^4}+\frac{5a^4b^3c^4d^3(ad-4bc)}{(ad-bc)^4}+a^4cd^3-\frac{a^3b^4c^5d^2(ad-4bc}{(ad-bc)^4}}{a^4d^4-4a^3bcd^3-6a^2b^2c^2d^2+4ab^3c^3d-b^4c^4}\right)}{b^2\left(ad-bc\right)^4}$$

$$+\frac{c^2\left(6a^2d^2-4abcd+b^2c^2\right)\log\left(x+\frac{\frac{a^5bc^2d^4\left(6a^2d^2-4abcd+b^2c^2\right)}{(ad-bc)^4}-\frac{5a^4b^2c^3d^3\left(6a^2d^2-4abcd+b^2c^2\right)}{(ad-bc)^4}+a^4cd^3+\frac{10a^3b^3c^4d^2\left(6a^2d^2-4abcd+b^2c^2}{(ad-bc)^4}}{a^4d^4-4a^3b}\right)}{d^3\left(ad-bc\right)^4}$$

$$+\frac{2a^4c^2d^3+7a^2b^2c^4d-3ab^3c^5+x^2\left(2a^4d^5+8ab^3c^3d^2-4\right.}{2a^4b^2c^2d^6-6a^3b^3c^3d^5+6a^2b^4c^4d^4-2ab^5c^5d^3+x^3\left(2a^3b^3d^8-6a^2b^4cd^7+6ab^5c^2d^6-2b^6c^3d^5\right)+x^2\left(2a^4b^2d^8-2\right.}$$

5.9 Problem number 490

$$\int x^{5/2}(a+bx)^{3/2}(A+Bx)\,dx$$

Optimal antiderivative

$$\frac{(12Ab-7aB)\,x^{\frac{7}{2}}(bx+a)^{\frac{3}{2}}}{60b}+\frac{B\,x^{\frac{7}{2}}(bx+a)^{\frac{5}{2}}}{6b}-\frac{a^5(12Ab-7aB)\operatorname{arctanh}\left(\frac{\sqrt{b}\,\sqrt{x}}{\sqrt{bx+a}}\right)}{512b^{\frac{9}{2}}}$$
$$-\frac{a^3(12Ab-7aB)\,x^{\frac{3}{2}}\sqrt{bx+a}}{768b^3}+\frac{a^2(12Ab-7aB)\,x^{\frac{5}{2}}\sqrt{bx+a}}{960b^2}$$
$$+\frac{a(12Ab-7aB)\,x^{\frac{7}{2}}\sqrt{bx+a}}{160b}+\frac{a^4(12Ab-7aB)\,\sqrt{x}\,\sqrt{bx+a}}{512b^4}$$

command

```
integrate(x**(5/2)*(b*x+a)**(3/2)*(B*x+A),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

output too large to display

5.10 Problem number 502

$$\int x^{3/2}(a+bx)^{5/2}(A+Bx)\,dx$$

Optimal antiderivative

$$\frac{a(12Ab-5aB)\,x^{\frac{5}{2}}(bx+a)^{\frac{3}{2}}}{96b}+\frac{(12Ab-5aB)\,x^{\frac{5}{2}}(bx+a)^{\frac{5}{2}}}{60b}+\frac{B\,x^{\frac{5}{2}}(bx+a)^{\frac{7}{2}}}{6b}$$
$$+\frac{a^5(12Ab-5aB)\operatorname{arctanh}\left(\frac{\sqrt{b}\,\sqrt{x}}{\sqrt{bx+a}}\right)}{512b^{\frac{7}{2}}}+\frac{a^3(12Ab-5aB)\,x^{\frac{3}{2}}\sqrt{bx+a}}{768b^2}$$
$$+\frac{a^2(12Ab-5aB)\,x^{\frac{5}{2}}\sqrt{bx+a}}{192b}-\frac{a^4(12Ab-5aB)\,\sqrt{x}\,\sqrt{bx+a}}{512b^3}$$

command

```
integrate(x**(3/2)*(b*x+a)**(5/2)*(B*x+A),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

output too large to display

5.11 Problem number 514

$$\int \frac{x^{7/2}(A+Bx)}{\sqrt{a+bx}}\,dx$$

Optimal antiderivative

$$\frac{7a^4(10Ab-9aB)\operatorname{arctanh}\left(\frac{\sqrt{b}\,\sqrt{x}}{\sqrt{bx+a}}\right)}{128b^{\frac{11}{2}}}+\frac{7a^2(10Ab-9aB)\,x^{\frac{3}{2}}\sqrt{bx+a}}{192b^4}$$
$$-\frac{7a(10Ab-9aB)\,x^{\frac{5}{2}}\sqrt{bx+a}}{240b^3}+\frac{(10Ab-9aB)\,x^{\frac{7}{2}}\sqrt{bx+a}}{40b^2}$$
$$+\frac{B\,x^{\frac{9}{2}}\sqrt{bx+a}}{5b}-\frac{7a^3(10Ab-9aB)\,\sqrt{x}\,\sqrt{bx+a}}{128b^5}$$

command

```
integrate(x**(7/2)*(B*x+A)/(b*x+a)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{35Aa^{\frac{7}{2}}\sqrt{x}}{64b^4\sqrt{1+\frac{bx}{a}}}-\frac{35Aa^{\frac{5}{2}}x^{\frac{3}{2}}}{192b^3\sqrt{1+\frac{bx}{a}}}+\frac{7Aa^{\frac{3}{2}}x^{\frac{5}{2}}}{96b^2\sqrt{1+\frac{bx}{a}}}-\frac{A\sqrt{a}\,x^{\frac{7}{2}}}{24b\sqrt{1+\frac{bx}{a}}}$$
$$+\frac{35Aa^4\operatorname{asinh}\left(\frac{\sqrt{b}\,\sqrt{x}}{\sqrt{a}}\right)}{64b^{\frac{9}{2}}}+\frac{Ax^{\frac{9}{2}}}{4\sqrt{a}\,\sqrt{1+\frac{bx}{a}}}+\frac{63Ba^{\frac{9}{2}}\sqrt{x}}{128b^5\sqrt{1+\frac{bx}{a}}}$$
$$+\frac{21Ba^{\frac{7}{2}}x^{\frac{3}{2}}}{128b^4\sqrt{1+\frac{bx}{a}}}-\frac{21Ba^{\frac{5}{2}}x^{\frac{5}{2}}}{320b^3\sqrt{1+\frac{bx}{a}}}+\frac{3Ba^{\frac{3}{2}}x^{\frac{7}{2}}}{80b^2\sqrt{1+\frac{bx}{a}}}$$
$$-\frac{B\sqrt{a}\,x^{\frac{9}{2}}}{40b\sqrt{1+\frac{bx}{a}}}-\frac{63Ba^5\operatorname{asinh}\left(\frac{\sqrt{b}\,\sqrt{x}}{\sqrt{a}}\right)}{128b^{\frac{11}{2}}}+\frac{Bx^{\frac{11}{2}}}{5\sqrt{a}\,\sqrt{1+\frac{bx}{a}}}$$

5.12 Problem number 836

$$\int \frac{x^2}{\sqrt{-1+x}\,\sqrt{1+x}}\,dx$$

Optimal antiderivative

$$\frac{\operatorname{arccosh}(x)}{2}+\frac{x\sqrt{-1+x}\,\sqrt{1+x}}{2}$$

command

```
integrate(x**2/(-1+x)**(1/2)/(1+x)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{G_{6,6}^{6,2}\left(\begin{matrix}-\frac{3}{4},-\frac{1}{4} & -\frac{1}{2},-\frac{1}{2},0,1\\ -1,-\frac{3}{4},-\frac{1}{2},-\frac{1}{4},0,0\end{matrix}\middle|\frac{1}{x^2}\right)}{4\pi^{\frac{3}{2}}}-\frac{iG_{6,6}^{2,6}\left(\begin{matrix}-\frac{3}{2},-\frac{5}{4},-1,-\frac{3}{4},-\frac{1}{2},1 & \\ -\frac{5}{4},-\frac{3}{4} & -\frac{3}{2},-1,-1,0\end{matrix}\middle|\frac{e^{2i\pi}}{x^2}\right)}{4\pi^{\frac{3}{2}}}$$

5.13 Problem number 850

$$\int x^3(2+3x)^{3/2}\sqrt{1+4x}\,dx$$

Optimal antiderivative

$$\begin{aligned}&\frac{(4103-7968x)\,(2+3x)^{\frac{5}{2}}\,(1+4x)^{\frac{3}{2}}}{829440}+\frac{x^2(2+3x)^{\frac{5}{2}}\,(1+4x)^{\frac{3}{2}}}{72}\\&+\frac{1067875\operatorname{arcsinh}\left(\frac{\sqrt{15}\,\sqrt{1+4x}}{5}\right)\sqrt{3}}{254803968}+\frac{42715(2+3x)^{\frac{3}{2}}\,\sqrt{1+4x}}{15925248}\\&-\frac{8543(2+3x)^{\frac{5}{2}}\,\sqrt{1+4x}}{995328}+\frac{213575\sqrt{2+3x}\,\sqrt{1+4x}}{42467328}\end{aligned}$$

command

```
integrate(x**3*(2+3*x)**(3/2)*(1+4*x)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{3(4x+1)^{\frac{13}{2}}}{4096\sqrt{12x+8}}+\frac{7(4x+1)^{\frac{11}{2}}}{40960\sqrt{12x+8}}-\frac{869(4x+1)^{\frac{9}{2}}}{196608\sqrt{12x+8}}+\frac{2027(4x+1)^{\frac{7}{2}}}{1179648\sqrt{12x+8}}+\frac{119135(4x+1)^{\frac{5}{2}}}{14155776\sqrt{12x+8}}-\frac{904775(4x+1)^{\frac{3}{2}}}{84934656\sqrt{12x+8}}-\frac{1067875\sqrt{4x+1}}{84934656\sqrt{12x+8}}+\frac{1067875\sqrt{3}\ \operatorname{asinh}\left(\frac{\sqrt{15}\ \sqrt{4x+1}}{5}\right)}{254803968}$$

5.14 Problem number 908

$$\int \frac{(ex)^{3/2}}{\sqrt[4]{1-x}\ \sqrt[4]{1+x}}\,dx$$

Optimal antiderivative

$$-\frac{e^{\frac{3}{2}}\arctan\left(1-\frac{\sqrt{2}\ \sqrt{ex}}{(-x^2+1)^{\frac{1}{4}}\sqrt{e}}\right)\sqrt{2}}{8}+\frac{e^{\frac{3}{2}}\arctan\left(1+\frac{\sqrt{2}\ \sqrt{ex}}{(-x^2+1)^{\frac{1}{4}}\sqrt{e}}\right)\sqrt{2}}{8}-\frac{e^{\frac{3}{2}}\ln\left(\sqrt{e}-\frac{\sqrt{2}\ \sqrt{ex}}{(-x^2+1)^{\frac{1}{4}}}+\frac{x\sqrt{e}}{\sqrt{-x^2+1}}\right)\sqrt{2}}{16}+\frac{e^{\frac{3}{2}}\ln\left(\sqrt{e}+\frac{\sqrt{2}\ \sqrt{ex}}{(-x^2+1)^{\frac{1}{4}}}+\frac{x\sqrt{e}}{\sqrt{-x^2+1}}\right)\sqrt{2}}{16}-\frac{e\left(-x^2+1\right)^{\frac{3}{4}}\sqrt{ex}}{2}$$

command

```
integrate((e*x)**(3/2)/(1-x)**(1/4)/(1+x)**(1/4),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{ie^{\frac{3}{2}}G_{6,6}^{6,2}\left(\begin{matrix}-\frac{5}{8},-\frac{1}{8} & -\frac{1}{2},-\frac{1}{4},0,1\\ -1,-\frac{5}{8},-\frac{1}{2},-\frac{1}{8},0,0\end{matrix}\middle|\frac{e^{-2i\pi}}{x^2}\right)e^{\frac{i\pi}{4}}}{4\pi\Gamma\left(\frac{1}{4}\right)}-\frac{e^{\frac{3}{2}}G_{6,6}^{2,6}\left(\begin{matrix}-\frac{5}{4},-\frac{9}{8},-\frac{3}{4},-\frac{5}{8},-\frac{1}{4},1 & \\ -\frac{9}{8},-\frac{5}{8} & -\frac{5}{4},-1,-\frac{3}{4},0\end{matrix}\middle|\frac{1}{x^2}\right)}{4\pi\Gamma\left(\frac{1}{4}\right)}$$

5.15 Problem number 1034

$$\int \frac{(a+bx)^2(A+Bx)}{(d+ex)^8}\,dx$$

Optimal antiderivative

$$\frac{(-ae+bd)^2(-Ae+Bd)}{7e^4(ex+d)^7} - \frac{(-ae+bd)(-2Abe-Bae+3Bbd)}{6e^4(ex+d)^6} + \frac{b(-Abe-2Bae+3Bbd)}{5e^4(ex+d)^5} - \frac{b^2B}{4e^4(ex+d)^4}$$

command

```
integrate((b*x+a)**2*(B*x+A)/(e*x+d)**8,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-60Aa^2e^3-20Aabde^2-4Ab^2d^2e-10Ba^2de^2-8Babd^2e-3Bb^2d^3-105Bb^2e^3x^3+x^2(-84Ab^2e^3-168Babe^3-}{420d^7e^4+2940d^6e^5x+8820d^5e^6x^2+14700d^4e^7x^3+14700d^3e^8x^4+88}$$

5.16 Problem number 1046

$$\int \frac{(a+bx)^3(A+Bx)}{(d+ex)^6}\,dx$$

Optimal antiderivative

$$-\frac{(-Ae+Bd)(bx+a)^4}{5e(-ae+bd)(ex+d)^5} + \frac{(Abe-5Bae+4Bbd)(bx+a)^4}{20e(-ae+bd)^2(ex+d)^4}$$

command

```
integrate((b*x+a)**3*(B*x+A)/(e*x+d)**6,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-4Aa^3e^4-3Aa^2bde^3-2Aab^2d^2e^2-Ab^3d^3e-Ba^3de^3-2Ba^2bd^2e^2-3Bab^2d^3e-4Bb^3d^4-20Bb^3e^4x^4+x^3(-1}{}$$

5.17 Problem number 1047

$$\int \frac{(a+bx)^3(A+Bx)}{(d+ex)^7}\,dx$$

Optimal antiderivative

$$-\frac{(-Ae+Bd)\,(bx+a)^4}{6e\,(-ae+bd)\,(ex+d)^6}+\frac{(Abe-3Bae+2Bbd)\,(bx+a)^4}{15e\,(-ae+bd)^2\,(ex+d)^5}+\frac{b(Abe-3Bae+2Bbd)\,(bx+a)^4}{60e\,(-ae+bd)^3\,(ex+d)^4}$$

command

```
integrate((b*x+a)**3*(B*x+A)/(e*x+d)**7,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-10Aa^3e^4-6Aa^2bde^3-3Aab^2d^2e^2-Ab^3d^3e-2Ba^3de^3-3Ba^2bd^2e^2-3Bab^2d^3e-2Bb^3d^4-30Bb^3e^4x^4+x^3(-$$

5.18 Problem number 1063

$$\int \frac{(a+bx)^6(A+Bx)}{(d+ex)^4}\,dx$$

Optimal antiderivative

$$\begin{aligned}&-\frac{5b^3(-ae+bd)^2\,(-3Abe-4Bae+7Bbd)\,x}{e^7}+\frac{(-ae+bd)^6\,(-Ae+Bd)}{3e^8\,(ex+d)^3}\\&-\frac{(-ae+bd)^5\,(-6Abe-Bae+7Bbd)}{2e^8\,(ex+d)^2}+\frac{3b(-ae+bd)^4\,(-5Abe-2Bae+7Bbd)}{e^8\,(ex+d)}\\&+\frac{3b^4(-ae+bd)\,(-2Abe-5Bae+7Bbd)\,(ex+d)^2}{2e^8}-\frac{b^5(-Abe-6Bae+7Bbd)\,(ex+d)^3}{3e^8}\\&+\frac{b^6B(ex+d)^4}{4e^8}+\frac{5b^2(-ae+bd)^3\,(-4Abe-3Bae+7Bbd)\ln(ex+d)}{e^8}\end{aligned}$$

command

```
integrate((b*x+a)**6*(B*x+A)/(e*x+d)**4,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{Bb^6x^4}{4e^4}+\frac{5b^2(ae-bd)^3\left(4Abe+3Bae-7Bbd\right)\log\left(d+ex\right)}{e^8}$$
$$+x^3\left(\frac{Ab^6}{3e^4}+\frac{2Bab^5}{e^4}-\frac{4Bb^6d}{3e^5}\right)+x^2\left(\frac{3Aab^5}{e^4}-\frac{2Ab^6d}{e^5}+\frac{15Ba^2b^4}{2e^4}-\frac{12Bab^5d}{e^5}+\frac{5Bb^6d^2}{e^6}\right)$$
$$+x\left(\frac{15Aa^2b^4}{e^4}-\frac{24Aab^5d}{e^5}+\frac{10Ab^6d^2}{e^6}+\frac{20Ba^3b^3}{e^4}-\frac{60Ba^2b^4d}{e^5}+\frac{60Bab^5d^2}{e^6}-\frac{20Bb^6d^3}{e^7}\right)$$
$$+\frac{-2Aa^6e^7-6Aa^5bde^6-30Aa^4b^2d^2e^5+220Aa^3b^3d^3e^4-390Aa^2b^4d^4e^3+282Aab^5d^5e^2-74Ab^6d^6e-Ba^6de^6-1}{}$$

6 Test file number 15

Test folder name:

`test_cases/1_Algebraic_functions/1.1_Binomial_products/1.1.1_Linear/15_1.1.1.4-a+b_x-^m-c+d_x-^n-e+f_x-^p-g+h_x-^q`

6.1 Problem number 149

$$\int \frac{x\left(a+bx+cx^2\right)}{\sqrt{1-dx}\,\sqrt{1+dx}}\,dx$$

Optimal antiderivative

$$\frac{b\arcsin(dx)}{2d^3}-\frac{c\,x^2\sqrt{-d^2x^2+1}}{3d^2}-\frac{\left(3b\,d^2x+6a\,d^2+4c\right)\sqrt{-d^2x^2+1}}{6d^4}$$

command

```
integrate(x*(c*x**2+b*x+a)/(-d*x+1)**(1/2)/(d*x+1)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{iaG_{6,6}^{6,2}\left(\begin{matrix}-\frac{1}{4},\frac{1}{4} & 0,0,\frac{1}{2},1\\ -\frac{1}{2},-\frac{1}{4},0,\frac{1}{4},\frac{1}{2},0 & \end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^2}$$
$$-\frac{aG_{6,6}^{2,6}\left(\begin{matrix}-1,-\frac{3}{4},-\frac{1}{2},-\frac{1}{4},0,1 & \\ -\frac{3}{4},-\frac{1}{4} & -1,-\frac{1}{2},-\frac{1}{2},0\end{matrix}\middle|\frac{e^{-2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^2}$$
$$-\frac{ibG_{6,6}^{6,2}\left(\begin{matrix}-\frac{3}{4},-\frac{1}{4} & -\frac{1}{2},-\frac{1}{2},0,1\\ -1,-\frac{3}{4},-\frac{1}{2},-\frac{1}{4},0,0 & \end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^3}$$
$$+\frac{bG_{6,6}^{2,6}\left(\begin{matrix}-\frac{3}{2},-\frac{5}{4},-1,-\frac{3}{4},-\frac{1}{2},1 & \\ -\frac{5}{4},-\frac{3}{4} & -\frac{3}{2},-1,-1,0\end{matrix}\middle|\frac{e^{-2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^3}$$
$$-\frac{icG_{6,6}^{6,2}\left(\begin{matrix}-\frac{5}{4},-\frac{3}{4} & -1,-1,-\frac{1}{2},1\\ -\frac{3}{2},-\frac{5}{4},-1,-\frac{3}{4},-\frac{1}{2},0 & \end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^4}$$
$$-\frac{cG_{6,6}^{2,6}\left(\begin{matrix}-2,-\frac{7}{4},-\frac{3}{2},-\frac{5}{4},-1,1 & \\ -\frac{7}{4},-\frac{5}{4} & -2,-\frac{3}{2},-\frac{3}{2},0\end{matrix}\middle|\frac{e^{-2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^4}$$

6.2 Problem number 150

$$\int \frac{a+bx+cx^2}{\sqrt{1-dx}\,\sqrt{1+dx}}\,dx$$

Optimal antiderivative

$$\frac{\left(2a\,d^2+c\right)\arcsin(dx)}{2d^3}-\frac{b\sqrt{-d^2x^2+1}}{d^2}-\frac{cx\sqrt{-d^2x^2+1}}{2d^2}$$

command

```
integrate((c*x**2+b*x+a)/(-d*x+1)**(1/2)/(d*x+1)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{iaG_{6,6}^{6,2}\left(\begin{matrix}\frac{1}{4},\frac{3}{4} & \frac{1}{2},\frac{1}{2},1,1\\ 0,\frac{1}{4},\frac{1}{2},\frac{3}{4},1,0\end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d}+\frac{aG_{6,6}^{2,6}\left(\begin{matrix}-\frac{1}{2},-\frac{1}{4},0,\frac{1}{4},\frac{1}{2},1\\ -\frac{1}{4},\frac{1}{4}\end{matrix}\middle|\frac{e^{-2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d}$$
$$-\frac{ibG_{6,6}^{6,2}\left(\begin{matrix}-\frac{1}{4},\frac{1}{4} & 0,0,\frac{1}{2},1\\ -\frac{1}{2},-\frac{1}{4},0,\frac{1}{4},\frac{1}{2},0\end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^2}$$
$$-\frac{bG_{6,6}^{2,6}\left(\begin{matrix}-1,-\frac{3}{4},-\frac{1}{2},-\frac{1}{4},0,1\\ -\frac{3}{4},-\frac{1}{4}\end{matrix}\middle|\frac{e^{-2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^2}$$
$$-\frac{icG_{6,6}^{6,2}\left(\begin{matrix}-\frac{3}{4},-\frac{1}{4} & -\frac{1}{2},-\frac{1}{2},0,1\\ -1,-\frac{3}{4},-\frac{1}{2},-\frac{1}{4},0,0\end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^3}$$
$$+\frac{cG_{6,6}^{2,6}\left(\begin{matrix}-\frac{3}{2},-\frac{5}{4},-1,-\frac{3}{4},-\frac{1}{2},1\\ -\frac{5}{4},-\frac{3}{4}\end{matrix}\middle|\frac{e^{-2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^3}$$

6.3 Problem number 153

$$\int \frac{a+bx+cx^2}{x^3\sqrt{1-dx}\,\sqrt{1+dx}}\,dx$$

Optimal antiderivative

$$-\frac{(a\,d^2+2c)\,\operatorname{arctanh}\left(\sqrt{-d^2x^2+1}\right)}{2}-\frac{a\sqrt{-d^2x^2+1}}{2x^2}-\frac{b\sqrt{-d^2x^2+1}}{x}$$

command

```
integrate((c*x**2+b*x+a)/x**3/(-d*x+1)**(1/2)/(d*x+1)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{iad^2G_{6,6}^{5,3}\left(\begin{matrix}\frac{7}{4},\frac{9}{4},1 & 2,2,\frac{5}{2}\\ \frac{3}{2},\frac{7}{4},2,\frac{9}{4},\frac{5}{2} & 0\end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}-\frac{ad^2G_{6,6}^{2,6}\left(\begin{matrix}1,\frac{5}{4},\frac{3}{2},\frac{7}{4},2,1 & \\ \frac{5}{4},\frac{7}{4} & 1,\frac{3}{2},\frac{3}{2},0\end{matrix}\middle|\frac{e^{-2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}$$
$$+\frac{ibdG_{6,6}^{5,3}\left(\begin{matrix}\frac{5}{4},\frac{7}{4},1 & \frac{3}{2},\frac{3}{2},2\\ 1,\frac{5}{4},\frac{3}{2},\frac{7}{4},2 & 0\end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}+\frac{bdG_{6,6}^{2,6}\left(\begin{matrix}\frac{1}{2},\frac{3}{4},1,\frac{5}{4},\frac{3}{2},1 & \\ \frac{3}{4},\frac{5}{4} & \frac{1}{2},1,1,0\end{matrix}\middle|\frac{e^{-2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}$$
$$+\frac{icG_{6,6}^{5,3}\left(\begin{matrix}\frac{3}{4},\frac{5}{4},1 & 1,1,\frac{3}{2}\\ \frac{1}{2},\frac{3}{4},1,\frac{5}{4},\frac{3}{2} & 0\end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}-\frac{cG_{6,6}^{2,6}\left(\begin{matrix}0,\frac{1}{4},\frac{1}{2},\frac{3}{4},1,1 & \\ \frac{1}{4},\frac{3}{4} & 0,\frac{1}{2},\frac{1}{2},0\end{matrix}\middle|\frac{e^{-2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}$$

6.4 Problem number 154

$$\int \frac{x\left(a+bx+cx^2\right)}{\sqrt{-1+dx}\,\sqrt{1+dx}}\,dx$$

Optimal antiderivative

$$\frac{b\operatorname{arccosh}(dx)}{2d^3}+\frac{c\,x^2\sqrt{dx-1}\,\sqrt{dx+1}}{3d^2}+\frac{\left(3b\,d^2x+6a\,d^2+4c\right)\sqrt{dx-1}\,\sqrt{dx+1}}{6d^4}$$

command

```
integrate(x*(c*x**2+b*x+a)/(d*x-1)**(1/2)/(d*x+1)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{aG_{6,6}^{6,2}\left(\begin{matrix}-\frac{1}{4},\frac{1}{4} & 0,0,\frac{1}{2},1\\ -\frac{1}{2},-\frac{1}{4},0,\frac{1}{4},\frac{1}{2},0 & \end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^2}+\frac{iaG_{6,6}^{2,6}\left(\begin{matrix}-1,-\frac{3}{4},-\frac{1}{2},-\frac{1}{4},0,1 & \\ -\frac{3}{4},-\frac{1}{4} & -1,-\frac{1}{2},-\frac{1}{2},0\end{matrix}\middle|\frac{e^{2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^2}+\frac{bG_{6,6}^{6,2}\left(\begin{matrix}-\frac{3}{4},-\frac{1}{4} & -\frac{1}{2},-\frac{1}{2},0,1\\ -1,-\frac{3}{4},-\frac{1}{2},-\frac{1}{4},0,0 & \end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^3}-\frac{ibG_{6,6}^{2,6}\left(\begin{matrix}-\frac{3}{2},-\frac{5}{4},-1,-\frac{3}{4},-\frac{1}{2},1 & \\ -\frac{5}{4},-\frac{3}{4} & -\frac{3}{2},-1,-1,0\end{matrix}\middle|\frac{e^{2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^3}+\frac{cG_{6,6}^{6,2}\left(\begin{matrix}-\frac{5}{4},-\frac{3}{4} & -1,-1,-\frac{1}{2},1\\ -\frac{3}{2},-\frac{5}{4},-1,-\frac{3}{4},-\frac{1}{2},0 & \end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^4}+\frac{icG_{6,6}^{2,6}\left(\begin{matrix}-2,-\frac{7}{4},-\frac{3}{2},-\frac{5}{4},-1,1 & \\ -\frac{7}{4},-\frac{5}{4} & -2,-\frac{3}{2},-\frac{3}{2},0\end{matrix}\middle|\frac{e^{2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^4}$$

6.5 Problem number 155

$$\int \frac{a+bx+cx^2}{\sqrt{-1+dx}\,\sqrt{1+dx}}\,dx$$

Optimal antiderivative

$$\frac{\left(2a\,d^2+c\right)\operatorname{arccosh}(dx)}{2d^3}+\frac{(cx+2b)\,\sqrt{dx-1}\,\sqrt{dx+1}}{2d^2}$$

command

```
integrate((c*x**2+b*x+a)/(d*x-1)**(1/2)/(d*x+1)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{aG_{6,6}^{6,2}\left(\begin{matrix}\frac{1}{4},\frac{3}{4} & \frac{1}{2},\frac{1}{2},1,1\\ 0,\frac{1}{4},\frac{1}{2},\frac{3}{4},1,0\end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d}-\frac{iaG_{6,6}^{2,6}\left(\begin{matrix}-\frac{1}{2},-\frac{1}{4},0,\frac{1}{4},\frac{1}{2},1\\ -\frac{1}{4},\frac{1}{4}\end{matrix}\middle|\frac{e^{2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d}$$
$$+\frac{bG_{6,6}^{6,2}\left(\begin{matrix}-\frac{1}{4},\frac{1}{4} & 0,0,\frac{1}{2},1\\ -\frac{1}{2},-\frac{1}{4},0,\frac{1}{4},\frac{1}{2},0\end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^2}$$
$$+\frac{ibG_{6,6}^{2,6}\left(\begin{matrix}-1,-\frac{3}{4},-\frac{1}{2},-\frac{1}{4},0,1\\ -\frac{3}{4},-\frac{1}{4}\end{matrix}\middle|\frac{e^{2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^2}$$
$$+\frac{cG_{6,6}^{6,2}\left(\begin{matrix}-\frac{3}{4},-\frac{1}{4} & -\frac{1}{2},-\frac{1}{2},0,1\\ -1,-\frac{3}{4},-\frac{1}{2},-\frac{1}{4},0,0\end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^3}$$
$$-\frac{icG_{6,6}^{2,6}\left(\begin{matrix}-\frac{3}{2},-\frac{5}{4},-1,-\frac{3}{4},-\frac{1}{2},1\\ -\frac{5}{4},-\frac{3}{4}\end{matrix}\middle|\frac{e^{2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^3}$$

6.6 Problem number 158

$$\int \frac{a+bx+cx^2}{x^3\sqrt{-1+dx}\,\sqrt{1+dx}}\,dx$$

Optimal antiderivative

$$\frac{\left(a\,d^2+2c\right)\arctan\left(\sqrt{dx-1}\,\sqrt{dx+1}\right)}{2}+\frac{a\sqrt{dx-1}\,\sqrt{dx+1}}{2x^2}+\frac{b\sqrt{dx-1}\,\sqrt{dx+1}}{x}$$

command

```
integrate((c*x**2+b*x+a)/x**3/(d*x-1)**(1/2)/(d*x+1)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{ad^2G_{6,6}^{5,3}\left(\begin{matrix}\frac{7}{4},\frac{9}{4},1 & 2,2,\frac{5}{2}\\ \frac{3}{2},\frac{7}{4},2,\frac{9}{4},\frac{5}{2} & 0\end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}+\frac{iad^2G_{6,6}^{2,6}\left(\begin{matrix}1,\frac{5}{4},\frac{3}{2},\frac{7}{4},2,1 & \\ \frac{5}{4},\frac{7}{4} & 1,\frac{3}{2},\frac{3}{2},0\end{matrix}\middle|\frac{e^{2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}$$
$$-\frac{bdG_{6,6}^{5,3}\left(\begin{matrix}\frac{5}{4},\frac{7}{4},1 & \frac{3}{2},\frac{3}{2},2\\ 1,\frac{5}{4},\frac{3}{2},\frac{7}{4},2 & 0\end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}-\frac{ibdG_{6,6}^{2,6}\left(\begin{matrix}\frac{1}{2},\frac{3}{4},1,\frac{5}{4},\frac{3}{2},1 & \\ \frac{3}{4},\frac{5}{4} & \frac{1}{2},1,1,0\end{matrix}\middle|\frac{e^{2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}$$
$$-\frac{cG_{6,6}^{5,3}\left(\begin{matrix}\frac{3}{4},\frac{5}{4},1 & 1,1,\frac{3}{2}\\ \frac{1}{2},\frac{3}{4},1,\frac{5}{4},\frac{3}{2} & 0\end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}+\frac{icG_{6,6}^{2,6}\left(\begin{matrix}0,\frac{1}{4},\frac{1}{2},\frac{3}{4},1,1 & \\ \frac{1}{4},\frac{3}{4} & 0,\frac{1}{2},\frac{1}{2},0\end{matrix}\middle|\frac{e^{2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}$$

6.7 Problem number 159

$$\int \frac{a+bx+cx^2}{x^4\sqrt{-1+dx}\,\sqrt{1+dx}}\,dx$$

Optimal antiderivative

$$\frac{b\,d^2\arctan\left(\sqrt{dx-1}\,\sqrt{dx+1}\right)}{2}+\frac{a\sqrt{dx-1}\,\sqrt{dx+1}}{3x^3}$$
$$+\frac{b\sqrt{dx-1}\,\sqrt{dx+1}}{2x^2}+\frac{\left(2a\,d^2+3c\right)\sqrt{dx-1}\,\sqrt{dx+1}}{3x}$$

command

```
integrate((c*x**2+b*x+a)/x**4/(d*x-1)**(1/2)/(d*x+1)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{ad^3G_{6,6}^{5,3}\left(\begin{matrix}\frac{9}{4},\frac{11}{4},1 & \frac{5}{2},\frac{5}{2},3\\ 2,\frac{9}{4},\frac{5}{2},\frac{11}{4},3 & 0\end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}-\frac{iad^3G_{6,6}^{2,6}\left(\begin{matrix}\frac{3}{2},\frac{7}{4},2,\frac{9}{4},\frac{5}{2},1 & \\ \frac{7}{4},\frac{9}{4} & \frac{3}{2},2,2,0\end{matrix}\middle|\frac{e^{2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}$$
$$-\frac{bd^2G_{6,6}^{5,3}\left(\begin{matrix}\frac{7}{4},\frac{9}{4},1 & 2,2,\frac{5}{2}\\ \frac{3}{2},\frac{7}{4},2,\frac{9}{4},\frac{5}{2} & 0\end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}+\frac{ibd^2G_{6,6}^{2,6}\left(\begin{matrix}1,\frac{5}{4},\frac{3}{2},\frac{7}{4},2,1 & \\ \frac{5}{4},\frac{7}{4} & 1,\frac{3}{2},\frac{3}{2},0\end{matrix}\middle|\frac{e^{2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}$$
$$-\frac{cdG_{6,6}^{5,3}\left(\begin{matrix}\frac{5}{4},\frac{7}{4},1 & \frac{3}{2},\frac{3}{2},2\\ 1,\frac{5}{4},\frac{3}{2},\frac{7}{4},2 & 0\end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}-\frac{icdG_{6,6}^{2,6}\left(\begin{matrix}\frac{1}{2},\frac{3}{4},1,\frac{5}{4},\frac{3}{2},1 & \\ \frac{3}{4},\frac{5}{4} & \frac{1}{2},1,1,0\end{matrix}\middle|\frac{e^{2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}$$

7 Test file number 17

Test folder name:

`test_cases/1_Algebraic_functions/1.1_Binomial_products/1.1.1_Linear/17_1.1.1.6_P-x-a+b_x-^m-c+d_x-^n-e+f_x-^p`

7.1 Problem number 10

$$\int \frac{(e+fx)\left(A+Bx+Cx^2\right)}{\sqrt{1-dx}\,\sqrt{1+dx}}\,dx$$

Optimal antiderivative

$$\frac{\left(2A\,d^2e+Bf+Ce\right)\arcsin(dx)}{2d^3}-\frac{C(fx+e)^2\,\sqrt{-d^2x^2+1}}{3d^2f}$$
$$-\frac{\left(6d^2f(Af+Be)-2C\left(d^2e^2-2f^2\right)-d^2f(-3Bf+Ce)\,x\right)\sqrt{-d^2x^2+1}}{6d^4f}$$

command

```
integrate((f*x+e)*(C*x**2+B*x+A)/(-d*x+1)**(1/2)/(d*x+1)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

output too large to display

7.2 Problem number 11

$$\int \frac{A+Bx+Cx^2}{\sqrt{1-dx}\,\sqrt{1+dx}}\,dx$$

Optimal antiderivative

$$\frac{\left(2A\,d^2+C\right)\arcsin(dx)}{2d^3}-\frac{B\sqrt{-d^2x^2+1}}{d^2}-\frac{Cx\sqrt{-d^2x^2+1}}{2d^2}$$

command

```
integrate((C*x**2+B*x+A)/(-d*x+1)**(1/2)/(d*x+1)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{iAG_{6,6}^{6,2}\left(\begin{matrix}\frac{1}{4},\frac{3}{4} & \frac{1}{2},\frac{1}{2},1,1\\ 0,\frac{1}{4},\frac{1}{2},\frac{3}{4},1,0 & \end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d}+\frac{AG_{6,6}^{2,6}\left(\begin{matrix}-\frac{1}{2},-\frac{1}{4},0,\frac{1}{4},\frac{1}{2},1 & \\ -\frac{1}{4},\frac{1}{4} & -\frac{1}{2},0,0,0\end{matrix}\middle|\frac{e^{-2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d}$$
$$-\frac{iBG_{6,6}^{6,2}\left(\begin{matrix}-\frac{1}{4},\frac{1}{4} & 0,0,\frac{1}{2},1\\ -\frac{1}{2},-\frac{1}{4},0,\frac{1}{4},\frac{1}{2},0 & \end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^2}$$
$$-\frac{BG_{6,6}^{2,6}\left(\begin{matrix}-1,-\frac{3}{4},-\frac{1}{2},-\frac{1}{4},0,1 & \\ -\frac{3}{4},-\frac{1}{4} & -1,-\frac{1}{2},-\frac{1}{2},0\end{matrix}\middle|\frac{e^{-2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^2}$$
$$-\frac{iCG_{6,6}^{6,2}\left(\begin{matrix}-\frac{3}{4},-\frac{1}{4} & -\frac{1}{2},-\frac{1}{2},0,1\\ -1,-\frac{3}{4},-\frac{1}{2},-\frac{1}{4},0,0 & \end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^3}$$
$$+\frac{CG_{6,6}^{2,6}\left(\begin{matrix}-\frac{3}{2},-\frac{5}{4},-1,-\frac{3}{4},-\frac{1}{2},1 & \\ -\frac{5}{4},-\frac{3}{4} & -\frac{3}{2},-1,-1,0\end{matrix}\middle|\frac{e^{-2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^3}$$

7.3 Problem number 15

$$\int \frac{x\left(a+bx+cx^2\right)}{\sqrt{1-dx}\,\sqrt{1+dx}}\,dx$$

Optimal antiderivative

$$\frac{b\arcsin(dx)}{2d^3}-\frac{c\,x^2\sqrt{-d^2x^2+1}}{3d^2}-\frac{\left(3b\,d^2x+6a\,d^2+4c\right)\sqrt{-d^2x^2+1}}{6d^4}$$

command

```
integrate(x*(c*x**2+b*x+a)/(-d*x+1)**(1/2)/(d*x+1)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{iaG_{6,6}^{6,2}\left(\begin{matrix}-\frac{1}{4},\frac{1}{4} & 0,0,\frac{1}{2},1\\ -\frac{1}{2},-\frac{1}{4},0,\frac{1}{4},\frac{1}{2},0 & \end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^2}$$
$$-\frac{aG_{6,6}^{2,6}\left(\begin{matrix}-1,-\frac{3}{4},-\frac{1}{2},-\frac{1}{4},0,1 & \\ -\frac{3}{4},-\frac{1}{4} & -1,-\frac{1}{2},-\frac{1}{2},0\end{matrix}\middle|\frac{e^{-2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^2}$$
$$-\frac{ibG_{6,6}^{6,2}\left(\begin{matrix}-\frac{3}{4},-\frac{1}{4} & -\frac{1}{2},-\frac{1}{2},0,1\\ -1,-\frac{3}{4},-\frac{1}{2},-\frac{1}{4},0,0 & \end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^3}$$
$$+\frac{bG_{6,6}^{2,6}\left(\begin{matrix}-\frac{3}{2},-\frac{5}{4},-1,-\frac{3}{4},-\frac{1}{2},1 & \\ -\frac{5}{4},-\frac{3}{4} & -\frac{3}{2},-1,-1,0\end{matrix}\middle|\frac{e^{-2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^3}$$
$$-\frac{icG_{6,6}^{6,2}\left(\begin{matrix}-\frac{5}{4},-\frac{3}{4} & -1,-1,-\frac{1}{2},1\\ -\frac{3}{2},-\frac{5}{4},-1,-\frac{3}{4},-\frac{1}{2},0 & \end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^4}$$
$$-\frac{cG_{6,6}^{2,6}\left(\begin{matrix}-2,-\frac{7}{4},-\frac{3}{2},-\frac{5}{4},-1,1 & \\ -\frac{7}{4},-\frac{5}{4} & -2,-\frac{3}{2},-\frac{3}{2},0\end{matrix}\middle|\frac{e^{-2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^4}$$

7.4 Problem number 16

$$\int \frac{a+bx+cx^2}{\sqrt{1-dx}\,\sqrt{1+dx}}\,dx$$

Optimal antiderivative

$$\frac{\left(2a\,d^2+c\right)\arcsin(dx)}{2d^3}-\frac{b\sqrt{-d^2x^2+1}}{d^2}-\frac{cx\sqrt{-d^2x^2+1}}{2d^2}$$

command

```
integrate((c*x**2+b*x+a)/(-d*x+1)**(1/2)/(d*x+1)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{iaG_{6,6}^{6,2}\left(\begin{matrix}\frac{1}{4},\frac{3}{4} & \frac{1}{2},\frac{1}{2},1,1\\ 0,\frac{1}{4},\frac{1}{2},\frac{3}{4},1,0\end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d}+\frac{aG_{6,6}^{2,6}\left(\begin{matrix}-\frac{1}{2},-\frac{1}{4},0,\frac{1}{4},\frac{1}{2},1\\ -\frac{1}{4},\frac{1}{4}\end{matrix}\middle|\frac{e^{-2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d}$$
$$-\frac{ibG_{6,6}^{6,2}\left(\begin{matrix}-\frac{1}{4},\frac{1}{4} & 0,0,\frac{1}{2},1\\ -\frac{1}{2},-\frac{1}{4},0,\frac{1}{4},\frac{1}{2},0\end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^2}$$
$$-\frac{bG_{6,6}^{2,6}\left(\begin{matrix}-1,-\frac{3}{4},-\frac{1}{2},-\frac{1}{4},0,1\\ -\frac{3}{4},-\frac{1}{4}\end{matrix}\middle|\frac{e^{-2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^2}$$
$$-\frac{icG_{6,6}^{6,2}\left(\begin{matrix}-\frac{3}{4},-\frac{1}{4} & -\frac{1}{2},-\frac{1}{2},0,1\\ -1,-\frac{3}{4},-\frac{1}{2},-\frac{1}{4},0,0\end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^3}$$
$$+\frac{cG_{6,6}^{2,6}\left(\begin{matrix}-\frac{3}{2},-\frac{5}{4},-1,-\frac{3}{4},-\frac{1}{2},1\\ -\frac{5}{4},-\frac{3}{4}\end{matrix}\middle|\frac{e^{-2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^3}$$

7.5 Problem number 19

$$\int \frac{a+bx+cx^2}{x^3\sqrt{1-dx}\,\sqrt{1+dx}}\,dx$$

Optimal antiderivative

$$-\frac{(a\,d^2+2c)\,\operatorname{arctanh}\left(\sqrt{-d^2x^2+1}\right)}{2}-\frac{a\sqrt{-d^2x^2+1}}{2x^2}-\frac{b\sqrt{-d^2x^2+1}}{x}$$

command

```
integrate((c*x**2+b*x+a)/x**3/(-d*x+1)**(1/2)/(d*x+1)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{iad^2G_{6,6}^{5,3}\left(\begin{matrix}\frac{7}{4},\frac{9}{4},1 & 2,2,\frac{5}{2}\\ \frac{3}{2},\frac{7}{4},2,\frac{9}{4},\frac{5}{2} & 0\end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}-\frac{ad^2G_{6,6}^{2,6}\left(\begin{matrix}1,\frac{5}{4},\frac{3}{2},\frac{7}{4},2,1 & \\ \frac{5}{4},\frac{7}{4} & 1,\frac{3}{2},\frac{3}{2},0\end{matrix}\middle|\frac{e^{-2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}$$
$$+\frac{ibdG_{6,6}^{5,3}\left(\begin{matrix}\frac{5}{4},\frac{7}{4},1 & \frac{3}{2},\frac{3}{2},2\\ 1,\frac{5}{4},\frac{3}{2},\frac{7}{4},2 & 0\end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}+\frac{bdG_{6,6}^{2,6}\left(\begin{matrix}\frac{1}{2},\frac{3}{4},1,\frac{5}{4},\frac{3}{2},1 & \\ \frac{3}{4},\frac{5}{4} & \frac{1}{2},1,1,0\end{matrix}\middle|\frac{e^{-2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}$$
$$+\frac{icG_{6,6}^{5,3}\left(\begin{matrix}\frac{3}{4},\frac{5}{4},1 & 1,1,\frac{3}{2}\\ \frac{1}{2},\frac{3}{4},1,\frac{5}{4},\frac{3}{2} & 0\end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}-\frac{cG_{6,6}^{2,6}\left(\begin{matrix}0,\frac{1}{4},\frac{1}{2},\frac{3}{4},1,1 & \\ \frac{1}{4},\frac{3}{4} & 0,\frac{1}{2},\frac{1}{2},0\end{matrix}\middle|\frac{e^{-2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}$$

7.6 Problem number 30

$$\int \frac{A+Bx+Cx^2}{\sqrt{a+bx}\,\sqrt{ac-bcx}}\,dx$$

Optimal antiderivative

$$-\frac{B\left(-b^2x^2+a^2\right)}{b^2\sqrt{bx+a}\,\sqrt{-bcx+ac}}-\frac{Cx\left(-b^2x^2+a^2\right)}{2b^2\sqrt{bx+a}\,\sqrt{-bcx+ac}}$$
$$+\frac{\left(2A\,b^2+a^2C\right)\arctan\left(\frac{bx\sqrt{c}}{\sqrt{-b^2c\,x^2+a^2c}}\right)\sqrt{-b^2c\,x^2+a^2c}}{2b^3\sqrt{c}\,\sqrt{bx+a}\,\sqrt{-bcx+ac}}$$

command

```
integrate((C*x**2+B*x+A)/(b*x+a)**(1/2)/(-b*c*x+a*c)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{iAG_{6,6}^{6,2}\left(\begin{matrix}\frac{1}{4},\frac{3}{4} & \frac{1}{2},\frac{1}{2},1,1\\ 0,\frac{1}{4},\frac{1}{2},\frac{3}{4},1,0 & \end{matrix}\middle|\frac{a^2}{b^2x^2}\right)}{4\pi^{\frac{3}{2}}b\sqrt{c}}$$
$$+\frac{AG_{6,6}^{2,6}\left(\begin{matrix}-\frac{1}{2},-\frac{1}{4},0,\frac{1}{4},\frac{1}{2},1 & \\ -\frac{1}{4},\frac{1}{4} & -\frac{1}{2},0,0,0\end{matrix}\middle|\frac{a^2e^{-2i\pi}}{b^2x^2}\right)}{4\pi^{\frac{3}{2}}b\sqrt{c}}$$
$$-\frac{iBaG_{6,6}^{6,2}\left(\begin{matrix}-\frac{1}{4},\frac{1}{4} & 0,0,\frac{1}{2},1\\ -\frac{1}{2},-\frac{1}{4},0,\frac{1}{4},\frac{1}{2},0 & \end{matrix}\middle|\frac{a^2}{b^2x^2}\right)}{4\pi^{\frac{3}{2}}b^2\sqrt{c}}$$
$$-\frac{BaG_{6,6}^{2,6}\left(\begin{matrix}-1,-\frac{3}{4},-\frac{1}{2},-\frac{1}{4},0,1 & \\ -\frac{3}{4},-\frac{1}{4} & -1,-\frac{1}{2},-\frac{1}{2},0\end{matrix}\middle|\frac{a^2e^{-2i\pi}}{b^2x^2}\right)}{4\pi^{\frac{3}{2}}b^2\sqrt{c}}$$
$$-\frac{iCa^2G_{6,6}^{6,2}\left(\begin{matrix}-\frac{3}{4},-\frac{1}{4} & -\frac{1}{2},-\frac{1}{2},0,1\\ -1,-\frac{3}{4},-\frac{1}{2},-\frac{1}{4},0,0 & \end{matrix}\middle|\frac{a^2}{b^2x^2}\right)}{4\pi^{\frac{3}{2}}b^3\sqrt{c}}$$
$$+\frac{Ca^2G_{6,6}^{2,6}\left(\begin{matrix}-\frac{3}{2},-\frac{5}{4},-1,-\frac{3}{4},-\frac{1}{2},1 & \\ -\frac{5}{4},-\frac{3}{4} & -\frac{3}{2},-1,-1,0\end{matrix}\middle|\frac{a^2e^{-2i\pi}}{b^2x^2}\right)}{4\pi^{\frac{3}{2}}b^3\sqrt{c}}$$

7.7 Problem number 34

$$\int \frac{x\left(a+bx+cx^2\right)}{\sqrt{-1+dx}\,\sqrt{1+dx}}\,dx$$

Optimal antiderivative

$$\frac{b\operatorname{arccosh}(dx)}{2d^3}+\frac{c\,x^2\sqrt{dx-1}\,\sqrt{dx+1}}{3d^2}+\frac{\left(3b\,d^2x+6a\,d^2+4c\right)\sqrt{dx-1}\,\sqrt{dx+1}}{6d^4}$$

command

```
integrate(x*(c*x**2+b*x+a)/(d*x-1)**(1/2)/(d*x+1)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{aG_{6,6}^{6,2}\left(\begin{matrix}-\frac{1}{4},\frac{1}{4} & 0,0,\frac{1}{2},1\\ -\frac{1}{2},-\frac{1}{4},0,\frac{1}{4},\frac{1}{2},0 & \end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^2}$$
$$+\frac{iaG_{6,6}^{2,6}\left(\begin{matrix}-1,-\frac{3}{4},-\frac{1}{2},-\frac{1}{4},0,1 & \\ -\frac{3}{4},-\frac{1}{4} & -1,-\frac{1}{2},-\frac{1}{2},0\end{matrix}\middle|\frac{e^{2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^2}$$
$$+\frac{bG_{6,6}^{6,2}\left(\begin{matrix}-\frac{3}{4},-\frac{1}{4} & -\frac{1}{2},-\frac{1}{2},0,1\\ -1,-\frac{3}{4},-\frac{1}{2},-\frac{1}{4},0,0 & \end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^3}$$
$$-\frac{ibG_{6,6}^{2,6}\left(\begin{matrix}-\frac{3}{2},-\frac{5}{4},-1,-\frac{3}{4},-\frac{1}{2},1 & \\ -\frac{5}{4},-\frac{3}{4} & -\frac{3}{2},-1,-1,0\end{matrix}\middle|\frac{e^{2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^3}$$
$$+\frac{cG_{6,6}^{6,2}\left(\begin{matrix}-\frac{5}{4},-\frac{3}{4} & -1,-1,-\frac{1}{2},1\\ -\frac{3}{2},-\frac{5}{4},-1,-\frac{3}{4},-\frac{1}{2},0 & \end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^4}$$
$$+\frac{icG_{6,6}^{2,6}\left(\begin{matrix}-2,-\frac{7}{4},-\frac{3}{2},-\frac{5}{4},-1,1 & \\ -\frac{7}{4},-\frac{5}{4} & -2,-\frac{3}{2},-\frac{3}{2},0\end{matrix}\middle|\frac{e^{2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^4}$$

7.8 Problem number 35

$$\int \frac{a+bx+cx^2}{\sqrt{-1+dx}\,\sqrt{1+dx}}\,dx$$

Optimal antiderivative

$$\frac{\left(2a\,d^2+c\right)\operatorname{arccosh}(dx)}{2d^3}+\frac{(cx+2b)\,\sqrt{dx-1}\,\sqrt{dx+1}}{2d^2}$$

command

```
integrate((c*x**2+b*x+a)/(d*x-1)**(1/2)/(d*x+1)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{aG_{6,6}^{6,2}\left(\begin{matrix}\frac{1}{4},\frac{3}{4} & \frac{1}{2},\frac{1}{2},1,1\\ 0,\frac{1}{4},\frac{1}{2},\frac{3}{4},1,0\end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d}-\frac{iaG_{6,6}^{2,6}\left(\begin{matrix}-\frac{1}{2},-\frac{1}{4},0,\frac{1}{4},\frac{1}{2},1\\ -\frac{1}{4},\frac{1}{4}\end{matrix}\middle|\frac{e^{2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d}$$
$$+\frac{bG_{6,6}^{6,2}\left(\begin{matrix}-\frac{1}{4},\frac{1}{4} & 0,0,\frac{1}{2},1\\ -\frac{1}{2},-\frac{1}{4},0,\frac{1}{4},\frac{1}{2},0\end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^2}$$
$$+\frac{ibG_{6,6}^{2,6}\left(\begin{matrix}-1,-\frac{3}{4},-\frac{1}{2},-\frac{1}{4},0,1\\ -\frac{3}{4},-\frac{1}{4}\end{matrix}\middle|\frac{e^{2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^2}$$
$$+\frac{cG_{6,6}^{6,2}\left(\begin{matrix}-\frac{3}{4},-\frac{1}{4} & -\frac{1}{2},-\frac{1}{2},0,1\\ -1,-\frac{3}{4},-\frac{1}{2},-\frac{1}{4},0,0\end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^3}$$
$$-\frac{icG_{6,6}^{2,6}\left(\begin{matrix}-\frac{3}{2},-\frac{5}{4},-1,-\frac{3}{4},-\frac{1}{2},1\\ -\frac{5}{4},-\frac{3}{4}\end{matrix}\middle|\frac{e^{2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^3}$$

7.9 Problem number 38

$$\int \frac{a+bx+cx^2}{x^3\sqrt{-1+dx}\,\sqrt{1+dx}}\,dx$$

Optimal antiderivative

$$\frac{\left(a\,d^2+2c\right)\arctan\left(\sqrt{dx-1}\,\sqrt{dx+1}\right)}{2}+\frac{a\sqrt{dx-1}\,\sqrt{dx+1}}{2x^2}+\frac{b\sqrt{dx-1}\,\sqrt{dx+1}}{x}$$

command

```
integrate((c*x**2+b*x+a)/x**3/(d*x-1)**(1/2)/(d*x+1)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{ad^2G_{6,6}^{5,3}\left(\begin{matrix}\frac{7}{4},\frac{9}{4},1 & 2,2,\frac{5}{2}\\ \frac{3}{2},\frac{7}{4},2,\frac{9}{4},\frac{5}{2} & 0\end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}+\frac{iad^2G_{6,6}^{2,6}\left(\begin{matrix}1,\frac{5}{4},\frac{3}{2},\frac{7}{4},2,1 & \\ \frac{5}{4},\frac{7}{4} & 1,\frac{3}{2},\frac{3}{2},0\end{matrix}\middle|\frac{e^{2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}$$
$$-\frac{bdG_{6,6}^{5,3}\left(\begin{matrix}\frac{5}{4},\frac{7}{4},1 & \frac{3}{2},\frac{3}{2},2\\ 1,\frac{5}{4},\frac{3}{2},\frac{7}{4},2 & 0\end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}-\frac{ibdG_{6,6}^{2,6}\left(\begin{matrix}\frac{1}{2},\frac{3}{4},1,\frac{5}{4},\frac{3}{2},1 & \\ \frac{3}{4},\frac{5}{4} & \frac{1}{2},1,1,0\end{matrix}\middle|\frac{e^{2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}$$
$$-\frac{cG_{6,6}^{5,3}\left(\begin{matrix}\frac{3}{4},\frac{5}{4},1 & 1,1,\frac{3}{2}\\ \frac{1}{2},\frac{3}{4},1,\frac{5}{4},\frac{3}{2} & 0\end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}+\frac{icG_{6,6}^{2,6}\left(\begin{matrix}0,\frac{1}{4},\frac{1}{2},\frac{3}{4},1,1 & \\ \frac{1}{4},\frac{3}{4} & 0,\frac{1}{2},\frac{1}{2},0\end{matrix}\middle|\frac{e^{2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}$$

7.10 Problem number 39

$$\int \frac{a+bx+cx^2}{x^4\sqrt{-1+dx}\,\sqrt{1+dx}}\,dx$$

Optimal antiderivative

$$\frac{b\,d^2\arctan\left(\sqrt{dx-1}\,\sqrt{dx+1}\right)}{2}+\frac{a\sqrt{dx-1}\,\sqrt{dx+1}}{3x^3}$$
$$+\frac{b\sqrt{dx-1}\,\sqrt{dx+1}}{2x^2}+\frac{\left(2a\,d^2+3c\right)\sqrt{dx-1}\,\sqrt{dx+1}}{3x}$$

command

```
integrate((c*x**2+b*x+a)/x**4/(d*x-1)**(1/2)/(d*x+1)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{ad^3G_{6,6}^{5,3}\left(\begin{matrix}\frac{9}{4},\frac{11}{4},1 & \frac{5}{2},\frac{5}{2},3\\ 2,\frac{9}{4},\frac{5}{2},\frac{11}{4},3 & 0\end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}-\frac{iad^3G_{6,6}^{2,6}\left(\begin{matrix}\frac{3}{2},\frac{7}{4},2,\frac{9}{4},\frac{5}{2},1 & \\ \frac{7}{4},\frac{9}{4} & \frac{3}{2},2,2,0\end{matrix}\middle|\frac{e^{2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}$$
$$-\frac{bd^2G_{6,6}^{5,3}\left(\begin{matrix}\frac{7}{4},\frac{9}{4},1 & 2,2,\frac{5}{2}\\ \frac{3}{2},\frac{7}{4},2,\frac{9}{4},\frac{5}{2} & 0\end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}+\frac{ibd^2G_{6,6}^{2,6}\left(\begin{matrix}1,\frac{5}{4},\frac{3}{2},\frac{7}{4},2,1 & \\ \frac{5}{4},\frac{7}{4} & 1,\frac{3}{2},\frac{3}{2},0\end{matrix}\middle|\frac{e^{2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}$$
$$-\frac{cdG_{6,6}^{5,3}\left(\begin{matrix}\frac{5}{4},\frac{7}{4},1 & \frac{3}{2},\frac{3}{2},2\\ 1,\frac{5}{4},\frac{3}{2},\frac{7}{4},2 & 0\end{matrix}\middle|\frac{1}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}-\frac{icdG_{6,6}^{2,6}\left(\begin{matrix}\frac{1}{2},\frac{3}{4},1,\frac{5}{4},\frac{3}{2},1 & \\ \frac{3}{4},\frac{5}{4} & \frac{1}{2},1,1,0\end{matrix}\middle|\frac{e^{2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}}$$

8 Test file number 19

Test folder name:

`test_cases/1_Algebraic_functions/1.1_Binomial_products/1.1.2_Quadratic/19_1.1.2.2-c_x-^m-a+b_x^2-^p`

8.1 Problem number 424

$$\int \frac{\left(a+bx^2\right)^{9/2}}{x^{15}}\,dx$$

Optimal antiderivative

$$-\frac{3b^3\left(b\,x^2+a\right)^{\frac{3}{2}}}{128x^8}-\frac{3b^2\left(b\,x^2+a\right)^{\frac{5}{2}}}{80x^{10}}-\frac{3b\left(b\,x^2+a\right)^{\frac{7}{2}}}{56x^{12}}-\frac{\left(b\,x^2+a\right)^{\frac{9}{2}}}{14x^{14}}$$
$$-\frac{9b^7\operatorname{arctanh}\left(\frac{\sqrt{b\,x^2+a}}{\sqrt{a}}\right)}{2048a^{\frac{5}{2}}}-\frac{3b^4\sqrt{b\,x^2+a}}{256x^6}-\frac{3b^5\sqrt{b\,x^2+a}}{1024a\,x^4}+\frac{9b^6\sqrt{b\,x^2+a}}{2048a^2x^2}$$

command

```
integrate((b*x**2+a)**(9/2)/x**15,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{a^5}{14\sqrt{b}\,x^{15}\sqrt{\frac{a}{bx^2}+1}}-\frac{23a^4\sqrt{b}}{56x^{13}\sqrt{\frac{a}{bx^2}+1}}-\frac{541a^3b^{\frac{3}{2}}}{560x^{11}\sqrt{\frac{a}{bx^2}+1}}$$
$$-\frac{5249a^2b^{\frac{5}{2}}}{4480x^9\sqrt{\frac{a}{bx^2}+1}}-\frac{6653ab^{\frac{7}{2}}}{8960x^7\sqrt{\frac{a}{bx^2}+1}}-\frac{1027b^{\frac{9}{2}}}{5120x^5\sqrt{\frac{a}{bx^2}+1}}$$
$$+\frac{3b^{\frac{11}{2}}}{2048ax^3\sqrt{\frac{a}{bx^2}+1}}+\frac{9b^{\frac{13}{2}}}{2048a^2x\sqrt{\frac{a}{bx^2}+1}}-\frac{9b^7\operatorname{asinh}\left(\frac{\sqrt{a}}{\sqrt{b}\,x}\right)}{2048a^{\frac{5}{2}}}$$

8.2 Problem number 425

$$\int x^6 \left(a+bx^2\right)^{9/2}\,dx$$

Optimal antiderivative

$$\frac{3a^3x^7\left(b\,x^2+a\right)^{\frac{3}{2}}}{256}+\frac{3a^2x^7\left(b\,x^2+a\right)^{\frac{5}{2}}}{128}+\frac{9a\,x^7\left(b\,x^2+a\right)^{\frac{7}{2}}}{224}$$
$$+\frac{x^7\left(b\,x^2+a\right)^{\frac{9}{2}}}{16}-\frac{45a^8\operatorname{arctanh}\left(\frac{x\sqrt{b}}{\sqrt{b\,x^2+a}}\right)}{32768b^{\frac{7}{2}}}+\frac{45a^7x\sqrt{b\,x^2+a}}{32768b^3}$$
$$-\frac{15a^6x^3\sqrt{b\,x^2+a}}{16384b^2}+\frac{3a^5x^5\sqrt{b\,x^2+a}}{4096b}+\frac{9a^4x^7\sqrt{b\,x^2+a}}{2048}$$

command

```
integrate(x**6*(b*x**2+a)**(9/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{45a^{\frac{15}{2}}x}{32768b^3\sqrt{1+\frac{bx^2}{a}}}+\frac{15a^{\frac{13}{2}}x^3}{32768b^2\sqrt{1+\frac{bx^2}{a}}}-\frac{3a^{\frac{11}{2}}x^5}{16384b\sqrt{1+\frac{bx^2}{a}}}$$
$$+\frac{4099a^{\frac{9}{2}}x^7}{28672\sqrt{1+\frac{bx^2}{a}}}+\frac{8191a^{\frac{7}{2}}bx^9}{14336\sqrt{1+\frac{bx^2}{a}}}+\frac{1699a^{\frac{5}{2}}b^2x^{11}}{1792\sqrt{1+\frac{bx^2}{a}}}+\frac{725a^{\frac{3}{2}}b^3x^{13}}{896\sqrt{1+\frac{bx^2}{a}}}$$
$$+\frac{79\sqrt{a}\,b^4x^{15}}{224\sqrt{1+\frac{bx^2}{a}}}-\frac{45a^8\operatorname{asinh}\left(\frac{\sqrt{b}\,x}{\sqrt{a}}\right)}{32768b^{\frac{7}{2}}}+\frac{b^5x^{17}}{16\sqrt{a}\,\sqrt{1+\frac{bx^2}{a}}}$$

8.3 Problem number 426

$$\int x^4 \left(a+bx^2\right)^{9/2}\,dx$$

Optimal antiderivative

$$\frac{3a^3x^5\left(b\,x^2+a\right)^{\frac{3}{2}}}{128}+\frac{3a^2x^5\left(b\,x^2+a\right)^{\frac{5}{2}}}{80}+\frac{3a\,x^5\left(b\,x^2+a\right)^{\frac{7}{2}}}{56}+\frac{x^5\left(b\,x^2+a\right)^{\frac{9}{2}}}{14}$$
$$+\frac{9a^7\operatorname{arctanh}\left(\frac{x\sqrt{b}}{\sqrt{b\,x^2+a}}\right)}{2048b^{\frac{5}{2}}}-\frac{9a^6x\sqrt{b\,x^2+a}}{2048b^2}+\frac{3a^5x^3\sqrt{b\,x^2+a}}{1024b}+\frac{3a^4x^5\sqrt{b\,x^2+a}}{256}$$

command

```
integrate(x**4*(b*x**2+a)**(9/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{9a^{\frac{13}{2}}x}{2048b^2\sqrt{1+\frac{bx^2}{a}}}-\frac{3a^{\frac{11}{2}}x^3}{2048b\sqrt{1+\frac{bx^2}{a}}}+\frac{1027a^{\frac{9}{2}}x^5}{5120\sqrt{1+\frac{bx^2}{a}}}+\frac{6653a^{\frac{7}{2}}bx^7}{8960\sqrt{1+\frac{bx^2}{a}}}$$
$$+\frac{5249a^{\frac{5}{2}}b^2x^9}{4480\sqrt{1+\frac{bx^2}{a}}}+\frac{541a^{\frac{3}{2}}b^3x^{11}}{560\sqrt{1+\frac{bx^2}{a}}}+\frac{23\sqrt{a}\,b^4x^{13}}{56\sqrt{1+\frac{bx^2}{a}}}+\frac{9a^7\operatorname{asinh}\left(\frac{\sqrt{b}\,x}{\sqrt{a}}\right)}{2048b^{\frac{5}{2}}}+\frac{b^5x^{15}}{14\sqrt{a}\,\sqrt{1+\frac{bx^2}{a}}}$$

9 Test file number 20

Test folder name:

```
test_cases/1_Algebraic_functions/1.1_Binomial_products/1.1.2_Quadratic/20_1.1.2.3-a+b_x^2-^p-c+d_x^2-^q
```

9.1 Problem number 62

$$\int \left(a+bx^2\right)^{5/2}\left(c+dx^2\right)^3\,dx$$

Optimal antiderivative

$$\frac{a\left(-5a^3d^3+36a^2bcd^2-120ab^2c^2d+320b^3c^3\right)x\left(bx^2+a\right)^{\frac{3}{2}}}{1536b^3}$$
$$+\frac{\left(-5a^3d^3+36a^2bcd^2-120ab^2c^2d+320b^3c^3\right)x\left(bx^2+a\right)^{\frac{5}{2}}}{1920b^3}$$
$$+\frac{d\left(15a^2d^2-68abcd+152b^2c^2\right)x\left(bx^2+a\right)^{\frac{7}{2}}}{960b^3}$$
$$+\frac{d(-5ad+16bc)\,x\left(bx^2+a\right)^{\frac{7}{2}}\left(dx^2+c\right)}{120b^2}+\frac{dx\left(bx^2+a\right)^{\frac{7}{2}}\left(dx^2+c\right)^2}{12b}$$
$$+\frac{a^3\left(-5a^3d^3+36a^2bcd^2-120ab^2c^2d+320b^3c^3\right)\operatorname{arctanh}\left(\frac{x\sqrt{b}}{\sqrt{bx^2+a}}\right)}{1024b^{\frac{7}{2}}}$$
$$+\frac{a^2\left(-5a^3d^3+36a^2bcd^2-120ab^2c^2d+320b^3c^3\right)x\sqrt{bx^2+a}}{1024b^3}$$

command

```
integrate((b*x**2+a)**(5/2)*(d*x**2+c)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{5a^{\frac{11}{2}}d^3x}{1024b^3\sqrt{1+\frac{bx^2}{a}}}-\frac{9a^{\frac{9}{2}}cd^2x}{256b^2\sqrt{1+\frac{bx^2}{a}}}+\frac{5a^{\frac{9}{2}}d^3x^3}{3072b^2\sqrt{1+\frac{bx^2}{a}}}+\frac{15a^{\frac{7}{2}}c^2dx}{128b\sqrt{1+\frac{bx^2}{a}}}$$
$$-\frac{3a^{\frac{7}{2}}cd^2x^3}{256b\sqrt{1+\frac{bx^2}{a}}}-\frac{a^{\frac{7}{2}}d^3x^5}{1536b\sqrt{1+\frac{bx^2}{a}}}+\frac{a^{\frac{5}{2}}c^3x\sqrt{1+\frac{bx^2}{a}}}{2}+\frac{3a^{\frac{5}{2}}c^3x}{16\sqrt{1+\frac{bx^2}{a}}}$$
$$+\frac{133a^{\frac{5}{2}}c^2dx^3}{128\sqrt{1+\frac{bx^2}{a}}}+\frac{387a^{\frac{5}{2}}cd^2x^5}{640\sqrt{1+\frac{bx^2}{a}}}+\frac{55a^{\frac{5}{2}}d^3x^7}{384\sqrt{1+\frac{bx^2}{a}}}+\frac{35a^{\frac{3}{2}}bc^3x^3}{48\sqrt{1+\frac{bx^2}{a}}}$$
$$+\frac{127a^{\frac{3}{2}}bc^2dx^5}{64\sqrt{1+\frac{bx^2}{a}}}+\frac{219a^{\frac{3}{2}}bcd^2x^7}{160\sqrt{1+\frac{bx^2}{a}}}+\frac{67a^{\frac{3}{2}}bd^3x^9}{192\sqrt{1+\frac{bx^2}{a}}}+\frac{17\sqrt{a}\,b^2c^3x^5}{24\sqrt{1+\frac{bx^2}{a}}}$$
$$+\frac{23\sqrt{a}\,b^2c^2dx^7}{16\sqrt{1+\frac{bx^2}{a}}}+\frac{87\sqrt{a}\,b^2cd^2x^9}{80\sqrt{1+\frac{bx^2}{a}}}+\frac{7\sqrt{a}\,b^2d^3x^{11}}{24\sqrt{1+\frac{bx^2}{a}}}-\frac{5a^6d^3\operatorname{asinh}\left(\frac{\sqrt{b}\,x}{\sqrt{a}}\right)}{1024b^{\frac{7}{2}}}$$
$$+\frac{9a^5cd^2\operatorname{asinh}\left(\frac{\sqrt{b}\,x}{\sqrt{a}}\right)}{256b^{\frac{5}{2}}}-\frac{15a^4c^2d\operatorname{asinh}\left(\frac{\sqrt{b}\,x}{\sqrt{a}}\right)}{128b^{\frac{3}{2}}}+\frac{5a^3c^3\operatorname{asinh}\left(\frac{\sqrt{b}\,x}{\sqrt{a}}\right)}{16\sqrt{b}}$$
$$+\frac{b^3c^3x^7}{6\sqrt{a}\,\sqrt{1+\frac{bx^2}{a}}}+\frac{3b^3c^2dx^9}{8\sqrt{a}\,\sqrt{1+\frac{bx^2}{a}}}+\frac{3b^3cd^2x^{11}}{10\sqrt{a}\,\sqrt{1+\frac{bx^2}{a}}}+\frac{b^3d^3x^{13}}{12\sqrt{a}\,\sqrt{1+\frac{bx^2}{a}}}$$

9.2 Problem number 63

$$\int \left(a+bx^2\right)^{5/2}\left(c+dx^2\right)^2\,dx$$

Optimal antiderivative

$$\frac{a\left(3a^2d^2-20abcd+80b^2c^2\right)x\left(bx^2+a\right)^{\frac{3}{2}}}{384b^2}+\frac{\left(3a^2d^2-20abcd+80b^2c^2\right)x\left(bx^2+a\right)^{\frac{5}{2}}}{480b^2}$$
$$+\frac{3d(-ad+4bc)x\left(bx^2+a\right)^{\frac{7}{2}}}{80b^2}+\frac{dx\left(bx^2+a\right)^{\frac{7}{2}}\left(dx^2+c\right)}{10b}$$
$$+\frac{a^3\left(3a^2d^2-20abcd+80b^2c^2\right)\operatorname{arctanh}\left(\frac{x\sqrt{b}}{\sqrt{bx^2+a}}\right)}{256b^{\frac{5}{2}}}$$
$$+\frac{a^2\left(3a^2d^2-20abcd+80b^2c^2\right)x\sqrt{bx^2+a}}{256b^2}$$

command

```
integrate((b*x**2+a)**(5/2)*(d*x**2+c)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{3a^{\frac{9}{2}}d^2x}{256b^2\sqrt{1+\frac{bx^2}{a}}}+\frac{5a^{\frac{7}{2}}cdx}{64b\sqrt{1+\frac{bx^2}{a}}}-\frac{a^{\frac{7}{2}}d^2x^3}{256b\sqrt{1+\frac{bx^2}{a}}}+\frac{a^{\frac{5}{2}}c^2x\sqrt{1+\frac{bx^2}{a}}}{2}$$
$$+\frac{3a^{\frac{5}{2}}c^2x}{16\sqrt{1+\frac{bx^2}{a}}}+\frac{133a^{\frac{5}{2}}cdx^3}{192\sqrt{1+\frac{bx^2}{a}}}+\frac{129a^{\frac{5}{2}}d^2x^5}{640\sqrt{1+\frac{bx^2}{a}}}+\frac{35a^{\frac{3}{2}}bc^2x^3}{48\sqrt{1+\frac{bx^2}{a}}}$$
$$+\frac{127a^{\frac{3}{2}}bcdx^5}{96\sqrt{1+\frac{bx^2}{a}}}+\frac{73a^{\frac{3}{2}}bd^2x^7}{160\sqrt{1+\frac{bx^2}{a}}}+\frac{17\sqrt{a}\,b^2c^2x^5}{24\sqrt{1+\frac{bx^2}{a}}}+\frac{23\sqrt{a}\,b^2cdx^7}{24\sqrt{1+\frac{bx^2}{a}}}$$
$$+\frac{29\sqrt{a}\,b^2d^2x^9}{80\sqrt{1+\frac{bx^2}{a}}}+\frac{3a^5d^2\operatorname{asinh}\left(\frac{\sqrt{b}\,x}{\sqrt{a}}\right)}{256b^{\frac{5}{2}}}-\frac{5a^4cd\operatorname{asinh}\left(\frac{\sqrt{b}\,x}{\sqrt{a}}\right)}{64b^{\frac{3}{2}}}$$
$$+\frac{5a^3c^2\operatorname{asinh}\left(\frac{\sqrt{b}\,x}{\sqrt{a}}\right)}{16\sqrt{b}}+\frac{b^3c^2x^7}{6\sqrt{a}\,\sqrt{1+\frac{bx^2}{a}}}+\frac{b^3cdx^9}{4\sqrt{a}\,\sqrt{1+\frac{bx^2}{a}}}+\frac{b^3d^2x^{11}}{10\sqrt{a}\,\sqrt{1+\frac{bx^2}{a}}}$$

10 Test file number 21

Test folder name:

`test_cases/1_Algebraic_functions/1.1_Binomial_products/1.1.2_Quadratic/21_1.1.2.4-e_x-^m-a+b_x^2-^p-c+d_x^2-^q`

10.1 Problem number 46

$$\int \frac{\left(a+bx^2\right)^5 \left(A+Bx^2\right)}{x^{14}}\,dx$$

Optimal antiderivative

$$-\frac{a^5 A}{13x^{13}}-\frac{a^4(5Ab+aB)}{11x^{11}}-\frac{5a^3b(2Ab+aB)}{9x^9}-\frac{10a^2b^2(Ab+aB)}{7x^7}$$
$$-\frac{a\,b^3(Ab+2aB)}{x^5}-\frac{b^4(Ab+5aB)}{3x^3}-\frac{b^5B}{x}$$

command

```
integrate((b*x**2+a)**5*(B*x**2+A)/x**14,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-693Aa^5-9009Bb^5x^{12}+x^{10}\left(-3003Ab^5-15015Bab^4\right)+x^8\left(-9009Aab^4-18018Ba^2b^3\right)+x^6\left(-12870Aa^2b^3-1}{9009x^{13}}$$

10.2 Problem number 48

$$\int \frac{\left(a+bx^2\right)^5 \left(A+Bx^2\right)}{x^{16}}\,dx$$

Optimal antiderivative

$$-\frac{a^5 A}{15x^{15}}-\frac{a^4(5Ab+aB)}{13x^{13}}-\frac{5a^3b(2Ab+aB)}{11x^{11}}-\frac{10a^2b^2(Ab+aB)}{9x^9}$$
$$-\frac{5a\,b^3(Ab+2aB)}{7x^7}-\frac{b^4(Ab+5aB)}{5x^5}-\frac{b^5B}{3x^3}$$

command

```
integrate((b*x**2+a)**5*(B*x**2+A)/x**16,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-3003Aa^5-15015Bb^5x^{12}+x^{10}\left(-9009Ab^5-45045Bab^4\right)+x^8\left(-32175Aab^4-64350Ba^2b^3\right)+x^6\left(-50050Aa^2b^3$$
$$45045x^{15}$$

10.3 Problem number 49

$$\int \frac{\left(a+bx^2\right)^5\left(A+Bx^2\right)}{x^{17}}\,dx$$

Optimal antiderivative

$$-\frac{A\left(b\,x^2+a\right)^6}{16a\,x^{16}}+\frac{(Ab-4aB)\left(b\,x^2+a\right)^6}{56a^2x^{14}}-\frac{b(Ab-4aB)\left(b\,x^2+a\right)^6}{336a^3x^{12}}$$

command

```
integrate((b*x**2+a)**5*(B*x**2+A)/x**17,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-21Aa^5-84Bb^5x^{12}+x^{10}\left(-56Ab^5-280Bab^4\right)+x^8\left(-210Aab^4-420Ba^2b^3\right)+x^6\left(-336Aa^2b^3-336Ba^3b^2\right)+x$$
$$336x^{16}$$

10.4 Problem number 50

$$\int \frac{\left(a+bx^2\right)^5\left(A+Bx^2\right)}{x^{18}}\,dx$$

Optimal antiderivative

$$-\frac{a^5A}{17x^{17}}-\frac{a^4(5Ab+aB)}{15x^{15}}-\frac{5a^3b(2Ab+aB)}{13x^{13}}-\frac{10a^2b^2(Ab+aB)}{11x^{11}}$$
$$-\frac{5a\,b^3(Ab+2aB)}{9x^9}-\frac{b^4(Ab+5aB)}{7x^7}-\frac{b^5B}{5x^5}$$

command

```
integrate((b*x**2+a)**5*(B*x**2+A)/x**18,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-45045Aa^5 - 153153Bb^5x^{12} + x^{10}\left(-109395Ab^5 - 546975Bab^4\right) + x^8\left(-425425Aab^4 - 850850Ba^2b^3\right) + x^6\left(-6961\right.}{765765x^{17}}$$

10.5 Problem number 51

$$\int \frac{\left(a+bx^2\right)^5\left(A+Bx^2\right)}{x^{19}}\,dx$$

Optimal antiderivative

$$-\frac{a^5A}{18x^{18}} - \frac{a^4(5Ab+aB)}{16x^{16}} - \frac{5a^3b(2Ab+aB)}{14x^{14}} - \frac{5a^2b^2(Ab+aB)}{6x^{12}} - \frac{a\,b^3(Ab+2aB)}{2x^{10}} - \frac{b^4(Ab+5aB)}{8x^8} - \frac{b^5B}{6x^6}$$

command

```
integrate((b*x**2+a)**5*(B*x**2+A)/x**19,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-56Aa^5 - 168Bb^5x^{12} + x^{10}\left(-126Ab^5 - 630Bab^4\right) + x^8\left(-504Aab^4 - 1008Ba^2b^3\right) + x^6\left(-840Aa^2b^3 - 840Ba^3b^2\right) +}{1008x^{18}}$$

10.6 Problem number 53

$$\int \frac{\left(a+bx^2\right)^5\left(A+Bx^2\right)}{x^{21}}\,dx$$

Optimal antiderivative

$$-\frac{a^5A}{20x^{20}} - \frac{a^4(5Ab+aB)}{18x^{18}} - \frac{5a^3b(2Ab+aB)}{16x^{16}} - \frac{5a^2b^2(Ab+aB)}{7x^{14}} - \frac{5a\,b^3(Ab+2aB)}{12x^{12}} - \frac{b^4(Ab+5aB)}{10x^{10}} - \frac{b^5B}{8x^8}$$

command

```
integrate((b*x**2+a)**5*(B*x**2+A)/x**21,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-252Aa^5 - 630Bb^5x^{12} + x^{10}\left(-504Ab^5 - 2520Bab^4\right) + x^8\left(-2100Aab^4 - 4200Ba^2b^3\right) + x^6\left(-3600Aa^2b^3 - 3600B}{5040x^{20}}$$

10.7 Problem number 228

$$\int \frac{x^5}{(a+bx^2)\,(c+dx^2)}\,dx$$

Optimal antiderivative

$$\frac{x^2}{2bd} + \frac{a^2\ln\left(b\,x^2+a\right)}{2b^2\,(-ad+bc)} - \frac{c^2\ln\left(d\,x^2+c\right)}{2d^2\,(-ad+bc)}$$

command

```
integrate(x**5/(b*x**2+a)/(d*x**2+c),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{a^2\log\left(x^2+\frac{\frac{a^4d^3}{b(ad-bc)}-\frac{2a^3cd^2}{ad-bc}+\frac{a^2bc^2d}{ad-bc}+a^2cd+abc^2}{a^2d^2+b^2c^2}\right)}{2b^2\,(ad-bc)} + \frac{c^2\log\left(x^2+\frac{-\frac{a^2bc^2d}{ad-bc}+a^2cd+\frac{2ab^2c^3}{ad-bc}+abc^2-\frac{b^3c^4}{d(ad-bc)}}{a^2d^2+b^2c^2}\right)}{2d^2\,(ad-bc)} + \frac{x^2}{2bd}$$

10.8 Problem number 237

$$\int \frac{1}{x^4 \left(a+bx^2\right) \left(c+dx^2\right)} \, dx$$

Optimal antiderivative

$$-\frac{1}{3acx^3}+\frac{ad+bc}{a^2c^2x}+\frac{b^{\frac{5}{2}} \arctan\left(\frac{x\sqrt{b}}{\sqrt{a}}\right)}{a^{\frac{5}{2}} \left(-ad+bc\right)}-\frac{d^{\frac{5}{2}} \arctan\left(\frac{x\sqrt{d}}{\sqrt{c}}\right)}{c^{\frac{5}{2}} \left(-ad+bc\right)}$$

command

```
integrate(1/x**4/(b*x**2+a)/(d*x**2+c),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

output too large to display

10.9 Problem number 335

$$\int \frac{x^m}{\left(a+bx^2\right)^2 \left(c+dx^2\right)} \, dx$$

Optimal antiderivative

$$\begin{aligned}
&\frac{b\,x^{1+m}}{2a\left(-ad+bc\right)\left(b\,x^2+a\right)} \\
&+\frac{b(bc(1-m)-ad(3-m))\,x^{1+m}\,\text{hypergeom}\left(\left[1,\frac{1}{2}+\frac{m}{2}\right],\left[\frac{3}{2}+\frac{m}{2}\right],-\frac{b\,x^2}{a}\right)}{2a^2\left(-ad+bc\right)^2\left(1+m\right)} \\
&+\frac{d^2x^{1+m}\,\text{hypergeom}\left(\left[1,\frac{1}{2}+\frac{m}{2}\right],\left[\frac{3}{2}+\frac{m}{2}\right],-\frac{d\,x^2}{c}\right)}{c\left(-ad+bc\right)^2\left(1+m\right)}
\end{aligned}$$

command

```
integrate(x**m/(b*x**2+a)**2/(d*x**2+c),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

output too large to display

10.10 Problem number 340

$$\int \frac{x^m}{(a+bx^2)^2\,(c+dx^2)}\,dx$$

Optimal antiderivative

$$\begin{aligned}
&\frac{b\,x^{1+m}}{2a\,(-ad+bc)\,(b\,x^2+a)} \\
&+\frac{b(bc(1-m)-ad(3-m))\,x^{1+m}\,\text{hypergeom}\left(\left[1,\frac{1}{2}+\frac{m}{2}\right],\left[\frac{3}{2}+\frac{m}{2}\right],-\frac{b\,x^2}{a}\right)}{2a^2\,(-ad+bc)^2\,(1+m)} \\
&+\frac{d^2x^{1+m}\,\text{hypergeom}\left(\left[1,\frac{1}{2}+\frac{m}{2}\right],\left[\frac{3}{2}+\frac{m}{2}\right],-\frac{d\,x^2}{c}\right)}{c\,(-ad+bc)^2\,(1+m)}
\end{aligned}$$

command

```
integrate(x**m/(b*x**2+a)**2/(d*x**2+c),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

output too large to display

10.11 Problem number 539

$$\int x^4\left(a+bx^2\right)^{5/2}\left(A+Bx^2\right)\,dx$$

Optimal antiderivative

$$\begin{aligned}
&\frac{a(12Ab-5aB)\,x^5\left(b\,x^2+a\right)^{\frac{3}{2}}}{192b}+\frac{(12Ab-5aB)\,x^5\left(b\,x^2+a\right)^{\frac{5}{2}}}{120b}+\frac{B\,x^5\left(b\,x^2+a\right)^{\frac{7}{2}}}{12b} \\
&+\frac{a^5(12Ab-5aB)\,\text{arctanh}\left(\frac{x\sqrt{b}}{\sqrt{b\,x^2+a}}\right)}{1024b^{\frac{7}{2}}}-\frac{a^4(12Ab-5aB)\,x\sqrt{b\,x^2+a}}{1024b^3} \\
&+\frac{a^3(12Ab-5aB)\,x^3\sqrt{b\,x^2+a}}{1536b^2}+\frac{a^2(12Ab-5aB)\,x^5\sqrt{b\,x^2+a}}{384b}
\end{aligned}$$

command

```
integrate(x**4*(b*x**2+a)**(5/2)*(B*x**2+A),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{3Aa^{\frac{9}{2}}x}{256b^2\sqrt{1+\frac{bx^2}{a}}}-\frac{Aa^{\frac{7}{2}}x^3}{256b\sqrt{1+\frac{bx^2}{a}}}+\frac{129Aa^{\frac{5}{2}}x^5}{640\sqrt{1+\frac{bx^2}{a}}}+\frac{73Aa^{\frac{3}{2}}bx^7}{160\sqrt{1+\frac{bx^2}{a}}}$$
$$+\frac{29A\sqrt{a}\,b^2x^9}{80\sqrt{1+\frac{bx^2}{a}}}+\frac{3Aa^5\operatorname{asinh}\left(\frac{\sqrt{b}\,x}{\sqrt{a}}\right)}{256b^{\frac{5}{2}}}+\frac{Ab^3x^{11}}{10\sqrt{a}\,\sqrt{1+\frac{bx^2}{a}}}$$
$$+\frac{5Ba^{\frac{11}{2}}x}{1024b^3\sqrt{1+\frac{bx^2}{a}}}+\frac{5Ba^{\frac{9}{2}}x^3}{3072b^2\sqrt{1+\frac{bx^2}{a}}}-\frac{Ba^{\frac{7}{2}}x^5}{1536b\sqrt{1+\frac{bx^2}{a}}}+\frac{55Ba^{\frac{5}{2}}x^7}{384\sqrt{1+\frac{bx^2}{a}}}$$
$$+\frac{67Ba^{\frac{3}{2}}bx^9}{192\sqrt{1+\frac{bx^2}{a}}}+\frac{7B\sqrt{a}\,b^2x^{11}}{24\sqrt{1+\frac{bx^2}{a}}}-\frac{5Ba^6\operatorname{asinh}\left(\frac{\sqrt{b}\,x}{\sqrt{a}}\right)}{1024b^{\frac{7}{2}}}+\frac{Bb^3x^{13}}{12\sqrt{a}\,\sqrt{1+\frac{bx^2}{a}}}$$

10.12 Problem number 613

$$\int x^4\left(a+bx^2\right)^2\left(c+dx^2\right)^{3/2}\,dx$$

Optimal antiderivative

$$\frac{\left(24a^2d^2+bc(-24ad+7bc)\right)x^5\left(d\,x^2+c\right)^{\frac{3}{2}}}{192d^2}-\frac{b(-24ad+7bc)\,x^5\left(d\,x^2+c\right)^{\frac{5}{2}}}{120d^2}$$
$$+\frac{b^2x^7\left(d\,x^2+c\right)^{\frac{5}{2}}}{12d}+\frac{c^4\left(24a^2d^2+bc(-24ad+7bc)\right)\operatorname{arctanh}\left(\frac{x\sqrt{d}}{\sqrt{d\,x^2+c}}\right)}{1024d^{\frac{9}{2}}}$$
$$-\frac{c^3\left(24a^2d^2+bc(-24ad+7bc)\right)x\sqrt{d\,x^2+c}}{1024d^4}$$
$$+\frac{c^2\left(24a^2d^2+bc(-24ad+7bc)\right)x^3\sqrt{d\,x^2+c}}{1536d^3}$$
$$+\frac{c\left(24a^2d^2+bc(-24ad+7bc)\right)x^5\sqrt{d\,x^2+c}}{384d^2}$$

command

```
integrate(x**4*(b*x**2+a)**2*(d*x**2+c)**(3/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{3a^2c^{\frac{7}{2}}x}{128d^2\sqrt{1+\frac{dx^2}{c}}}-\frac{a^2c^{\frac{5}{2}}x^3}{128d\sqrt{1+\frac{dx^2}{c}}}+\frac{13a^2c^{\frac{3}{2}}x^5}{64\sqrt{1+\frac{dx^2}{c}}}+\frac{5a^2\sqrt{c}\,dx^7}{16\sqrt{1+\frac{dx^2}{c}}}$$
$$+\frac{3a^2c^4\operatorname{asinh}\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)}{128d^{\frac{5}{2}}}+\frac{a^2d^2x^9}{8\sqrt{c}\sqrt{1+\frac{dx^2}{c}}}+\frac{3abc^{\frac{9}{2}}x}{128d^3\sqrt{1+\frac{dx^2}{c}}}$$
$$+\frac{abc^{\frac{7}{2}}x^3}{128d^2\sqrt{1+\frac{dx^2}{c}}}-\frac{abc^{\frac{5}{2}}x^5}{320d\sqrt{1+\frac{dx^2}{c}}}+\frac{23abc^{\frac{3}{2}}x^7}{80\sqrt{1+\frac{dx^2}{c}}}+\frac{19ab\sqrt{c}\,dx^9}{40\sqrt{1+\frac{dx^2}{c}}}$$
$$-\frac{3abc^5\operatorname{asinh}\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)}{128d^{\frac{7}{2}}}+\frac{abd^2x^{11}}{5\sqrt{c}\sqrt{1+\frac{dx^2}{c}}}-\frac{7b^2c^{\frac{11}{2}}x}{1024d^4\sqrt{1+\frac{dx^2}{c}}}$$
$$-\frac{7b^2c^{\frac{9}{2}}x^3}{3072d^3\sqrt{1+\frac{dx^2}{c}}}+\frac{7b^2c^{\frac{7}{2}}x^5}{7680d^2\sqrt{1+\frac{dx^2}{c}}}-\frac{b^2c^{\frac{5}{2}}x^7}{1920d\sqrt{1+\frac{dx^2}{c}}}$$
$$+\frac{107b^2c^{\frac{3}{2}}x^9}{960\sqrt{1+\frac{dx^2}{c}}}+\frac{23b^2\sqrt{c}\,dx^{11}}{120\sqrt{1+\frac{dx^2}{c}}}+\frac{7b^2c^6\operatorname{asinh}\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)}{1024d^{\frac{9}{2}}}+\frac{b^2d^2x^{13}}{12\sqrt{c}\sqrt{1+\frac{dx^2}{c}}}$$

10.13 Problem number 626

$$\int x^2\left(a+bx^2\right)^2\left(c+dx^2\right)^{5/2}\,dx$$

Optimal antiderivative

$$\frac{c\left(40a^2d^2+bc(-24ad+5bc)\right)x^3\left(d\,x^2+c\right)^{\frac{3}{2}}}{384d^2}+\frac{\left(40a^2d^2+bc(-24ad+5bc)\right)x^3\left(d\,x^2+c\right)^{\frac{5}{2}}}{320d^2}$$
$$-\frac{b(-24ad+5bc)\,x^3\left(d\,x^2+c\right)^{\frac{7}{2}}}{120d^2}+\frac{b^2x^5\left(d\,x^2+c\right)^{\frac{7}{2}}}{12d}$$
$$-\frac{c^4\left(40a^2d^2+bc(-24ad+5bc)\right)\operatorname{arctanh}\left(\frac{x\sqrt{d}}{\sqrt{d\,x^2+c}}\right)}{1024d^{\frac{7}{2}}}$$
$$+\frac{c^3\left(40a^2d^2+bc(-24ad+5bc)\right)x\sqrt{d\,x^2+c}}{1024d^3}$$
$$+\frac{c^2\left(40a^2d^2+bc(-24ad+5bc)\right)x^3\sqrt{d\,x^2+c}}{512d^2}$$

command

```
integrate(x**2*(b*x**2+a)**2*(d*x**2+c)**(5/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{5a^2c^{\frac{7}{2}}x}{128d\sqrt{1+\frac{dx^2}{c}}}+\frac{133a^2c^{\frac{5}{2}}x^3}{384\sqrt{1+\frac{dx^2}{c}}}+\frac{127a^2c^{\frac{3}{2}}dx^5}{192\sqrt{1+\frac{dx^2}{c}}}+\frac{23a^2\sqrt{c}\,d^2x^7}{48\sqrt{1+\frac{dx^2}{c}}}$$
$$-\frac{5a^2c^4\operatorname{asinh}\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)}{128d^{\frac{3}{2}}}+\frac{a^2d^3x^9}{8\sqrt{c}\sqrt{1+\frac{dx^2}{c}}}-\frac{3abc^{\frac{9}{2}}x}{128d^2\sqrt{1+\frac{dx^2}{c}}}$$
$$-\frac{abc^{\frac{7}{2}}x^3}{128d\sqrt{1+\frac{dx^2}{c}}}+\frac{129abc^{\frac{5}{2}}x^5}{320\sqrt{1+\frac{dx^2}{c}}}+\frac{73abc^{\frac{3}{2}}dx^7}{80\sqrt{1+\frac{dx^2}{c}}}+\frac{29ab\sqrt{c}\,d^2x^9}{40\sqrt{1+\frac{dx^2}{c}}}$$
$$+\frac{3abc^5\operatorname{asinh}\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)}{128d^{\frac{5}{2}}}+\frac{abd^3x^{11}}{5\sqrt{c}\sqrt{1+\frac{dx^2}{c}}}+\frac{5b^2c^{\frac{11}{2}}x}{1024d^3\sqrt{1+\frac{dx^2}{c}}}$$
$$+\frac{5b^2c^{\frac{9}{2}}x^3}{3072d^2\sqrt{1+\frac{dx^2}{c}}}-\frac{b^2c^{\frac{7}{2}}x^5}{1536d\sqrt{1+\frac{dx^2}{c}}}+\frac{55b^2c^{\frac{5}{2}}x^7}{384\sqrt{1+\frac{dx^2}{c}}}+\frac{67b^2c^{\frac{3}{2}}dx^9}{192\sqrt{1+\frac{dx^2}{c}}}$$
$$+\frac{7b^2\sqrt{c}\,d^2x^{11}}{24\sqrt{1+\frac{dx^2}{c}}}-\frac{5b^2c^6\operatorname{asinh}\left(\frac{\sqrt{d}x}{\sqrt{c}}\right)}{1024d^{\frac{7}{2}}}+\frac{b^2d^3x^{13}}{12\sqrt{c}\sqrt{1+\frac{dx^2}{c}}}$$

10.14 Problem number 1084

$$\int\frac{x}{\left(-2+3x^2\right)\left(-1+3x^2\right)^{3/4}}\,dx$$

Optimal antiderivative

$$-\frac{\arctan\left(\left(3x^2-1\right)^{\frac{1}{4}}\right)}{3}-\frac{\operatorname{arctanh}\left(\left(3x^2-1\right)^{\frac{1}{4}}\right)}{3}$$

command

`integrate(x/(3*x**2-2)/(3*x**2-1)**(3/4),x)`

Sympy 1.10.1 under Python 3.10.4 output

$$\int \frac{x}{(3x^2-2)\,(3x^2-1)^{\frac{3}{4}}}\,dx$$

Sympy 1.8 under Python 3.8.8 output

$$\frac{\log\left(\sqrt[4]{3x^2-1}-1\right)}{6}-\frac{\log\left(\sqrt[4]{3x^2-1}+1\right)}{6}-\frac{\operatorname{atan}\left(\sqrt[4]{3x^2-1}\right)}{3}$$

11 Test file number 22

Test folder name:

`test_cases/1_Algebraic_functions/1.1_Binomial_products/1.1.2_Quadratic/22_1.1.2.5-a+b_x^2-^p-c+d_x^2-^q-e+f_x^2-^r`

11.1 Problem number 15

$$\int \frac{\left(a+bx^2\right)\left(c+dx^2\right)^2}{\left(e+fx^2\right)^4}\,dx$$

Optimal antiderivative

$$-\frac{(-af+be)\,x\left(d\,x^2+c\right)^2}{6ef\,(f\,x^2+e)^3}-\frac{(de(af+5be)-cf(5af+be))\,x\left(d\,x^2+c\right)}{24e^2f^2\,(f\,x^2+e)^2}$$
$$-\frac{\left(af\left(-15c^2f^2+4cdef+3d^2e^2\right)+be\left(-3c^2f^2-4cdef+15d^2e^2\right)\right)x}{48e^3f^3\,(f\,x^2+e)}$$
$$+\frac{\left(be\left(c^2f^2+2cdef+5d^2e^2\right)+af\left(5c^2f^2+2cdef+d^2e^2\right)\right)\arctan\left(\frac{x\sqrt{f}}{\sqrt{e}}\right)}{16e^{\frac{7}{2}}f^{\frac{7}{2}}}$$

command

`integrate((b*x**2+a)*(d*x**2+c)**2/(f*x**2+e)**4,x)`

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{\sqrt{-\frac{1}{e^7f^7}}\left(5ac^2f^3+2acdef^2+ad^2e^2f+bc^2ef^2+2bcde^2f+5bd^2e^3\right)\log\left(-e^4f^3\sqrt{-\frac{1}{e^7f^7}}+x\right)}{32}$$
$$+\frac{\sqrt{-\frac{1}{e^7f^7}}\left(5ac^2f^3+2acdef^2+ad^2e^2f+bc^2ef^2+2bcde^2f+5bd^2e^3\right)\log\left(e^4f^3\sqrt{-\frac{1}{e^7f^7}}+x\right)}{32}$$
$$+\frac{x^5\left(15ac^2f^5+6acdef^4+3ad^2e^2f^3+3bc^2ef^4+6bcde^2f^3-33bd^2e^3f^2\right)+x^3\left(40ac^2ef^4+16acde^2f^3-8ad^2e^3f^2-\right.}{48e^6f^3+144e^5f^4x^2+14}$$

12 Test file number 24

Test folder name:

`test_cases/1_Algebraic_functions/1.1_Binomial_products/1.1.2_Quadratic/24_1.1.2.8_P-x-c_x-^m-a+b_x^2-^p`

12.1 Problem number 131

$$\int \frac{c+dx^2+ex^4+fx^6}{x^8\left(a+bx^2\right)^2}\,dx$$

Optimal antiderivative

$$-\frac{c}{7a^2x^7}+\frac{-ad+2bc}{5a^3x^5}+\frac{-a^2e+2abd-3b^2c}{3a^4x^3}+\frac{-a^3f+2a^2be-3a\,b^2d+4b^3c}{a^5x}$$
$$+\frac{b\left(-a^3f+a^2be-a\,b^2d+b^3c\right)x}{2a^5\left(b\,x^2+a\right)}+\frac{\left(-3a^3f+5a^2be-7a\,b^2d+9b^3c\right)\arctan\left(\frac{x\sqrt{b}}{\sqrt{a}}\right)\sqrt{b}}{2a^{\frac{11}{2}}}$$

command

```
integrate((f*x**6+e*x**4+d*x**2+c)/x**8/(b*x**2+a)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{\sqrt{-\frac{b}{a^{11}}}\left(3a^3f-5a^2be+7ab^2d-9b^3c\right)\log\left(-\frac{a^6\sqrt{-\frac{b}{a^{11}}}\left(3a^3f-5a^2be+7ab^2d-9b^3c\right)}{3a^3bf-5a^2b^2e+7ab^3d-9b^4c}+x\right)}{4}$$
$$-\frac{\sqrt{-\frac{b}{a^{11}}}\left(3a^3f-5a^2be+7ab^2d-9b^3c\right)\log\left(\frac{a^6\sqrt{-\frac{b}{a^{11}}}\left(3a^3f-5a^2be+7ab^2d-9b^3c\right)}{3a^3bf-5a^2b^2e+7ab^3d-9b^4c}+x\right)}{4}$$
$$+\frac{-30a^4c+x^8\left(-315a^3bf+525a^2b^2e-735ab^3d+945b^4c\right)+x^6\left(-210a^4f+350a^3be-490a^2b^2d+630ab^3c\right)+x^4\left(\right.}{210a^6x^7+210a^5bx^9}$$

12.2 Problem number 139

$$\int \frac{c + dx^2 + ex^4 + fx^6}{x^4 \left(a + bx^2\right)^3} \, dx$$

Optimal antiderivative

$$-\frac{c}{3a^3x^3} + \frac{-ad + 3bc}{a^4x} + \frac{\left(\frac{b^2c}{a^2} - \frac{bd}{a} + e - \frac{af}{b}\right)x}{4a\left(bx^2 + a\right)^2} + \frac{\left(a^3f + 3a^2be - 7ab^2d + 11b^3c\right)x}{8a^4b\left(bx^2 + a\right)} + \frac{\left(a^3f + 3a^2be - 15ab^2d + 35b^3c\right)\arctan\left(\frac{x\sqrt{b}}{\sqrt{a}}\right)}{8a^{\frac{9}{2}}b^{\frac{3}{2}}}$$

command

```
integrate((f*x**6+e*x**4+d*x**2+c)/x**4/(b*x**2+a)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{\sqrt{-\frac{1}{a^9b^3}}\left(a^3f + 3a^2be - 15ab^2d + 35b^3c\right)\log\left(-a^5b\sqrt{-\frac{1}{a^9b^3}} + x\right)}{16} + \frac{\sqrt{-\frac{1}{a^9b^3}}\left(a^3f + 3a^2be - 15ab^2d + 35b^3c\right)\log\left(a^5b\sqrt{-\frac{1}{a^9b^3}} + x\right)}{16} + \frac{-8a^3bc + x^6\left(3a^3bf + 9a^2b^2e - 45ab^3d + 105b^4c\right) + x^4\left(-3a^4f + 15a^3be - 75a^2b^2d + 175ab^3c\right) + x^2\left(-24a^3bd + 5}{24a^6bx^3 + 48a^5b^2x^5 + 24a^4b^3x^7}$$

12.3 Problem number 140

$$\int \frac{c + dx^2 + ex^4 + fx^6}{x^6 \left(a + bx^2\right)^3} \, dx$$

Optimal antiderivative

$$-\frac{c}{5a^3x^5} + \frac{-ad + 3bc}{3a^4x^3} + \frac{-a^2e + 3abd - 6b^2c}{a^5x} - \frac{\left(-a^3f + a^2be - ab^2d + b^3c\right)x}{4a^4\left(bx^2 + a\right)^2} - \frac{\left(-3a^3f + 7a^2be - 11ab^2d + 15b^3c\right)x}{8a^5\left(bx^2 + a\right)} - \frac{\left(-3a^3f + 15a^2be - 35ab^2d + 63b^3c\right)\arctan\left(\frac{x\sqrt{b}}{\sqrt{a}}\right)}{8a^{\frac{11}{2}}\sqrt{b}}$$

command

```
integrate((f*x**6+e*x**4+d*x**2+c)/x**6/(b*x**2+a)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{\sqrt{-\frac{1}{a^{11}b}}\left(3a^3f-15a^2be+35ab^2d-63b^3c\right)\log\left(-a^6\sqrt{-\frac{1}{a^{11}b}}+x\right)}{16}$$
$$+\frac{\sqrt{-\frac{1}{a^{11}b}}\left(3a^3f-15a^2be+35ab^2d-63b^3c\right)\log\left(a^6\sqrt{-\frac{1}{a^{11}b}}+x\right)}{16}$$
$$+\frac{-24a^4c+x^8\left(45a^3bf-225a^2b^2e+525ab^3d-945b^4c\right)+x^6\left(75a^4f-375a^3be+875a^2b^2d-1575ab^3c\right)+x^4(-120}{120a^7x^5+240a^6bx^7+120a^5b^2x^9}$$

12.4 Problem number 151

$$\int\frac{x^4\left(c+dx^2+ex^4+fx^6\right)}{\sqrt{a+bx^2}}\,dx$$

Optimal antiderivative

$$\frac{a^2\left(-63a^3f+70a^2be-80ab^2d+96b^3c\right)\operatorname{arctanh}\left(\frac{x\sqrt{b}}{\sqrt{bx^2+a}}\right)}{256b^{\frac{11}{2}}}$$
$$-\frac{a\left(-63a^3f+70a^2be-80ab^2d+96b^3c\right)x\sqrt{bx^2+a}}{256b^5}$$
$$+\frac{\left(-63a^3f+70a^2be-80ab^2d+96b^3c\right)x^3\sqrt{bx^2+a}}{384b^4}$$
$$+\frac{\left(63a^2f-70abe+80b^2d\right)x^5\sqrt{bx^2+a}}{480b^3}+\frac{\left(-9af+10be\right)x^7\sqrt{bx^2+a}}{80b^2}+\frac{fx^9\sqrt{bx^2+a}}{10b}$$

command

```
integrate(x**4*(f*x**6+e*x**4+d*x**2+c)/(b*x**2+a)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{63a^{\frac{9}{2}}fx}{256b^5\sqrt{1+\frac{bx^2}{a}}}-\frac{35a^{\frac{7}{2}}ex}{128b^4\sqrt{1+\frac{bx^2}{a}}}+\frac{21a^{\frac{7}{2}}fx^3}{256b^4\sqrt{1+\frac{bx^2}{a}}}+\frac{5a^{\frac{5}{2}}dx}{16b^3\sqrt{1+\frac{bx^2}{a}}}$$
$$-\frac{35a^{\frac{5}{2}}ex^3}{384b^3\sqrt{1+\frac{bx^2}{a}}}-\frac{21a^{\frac{5}{2}}fx^5}{640b^3\sqrt{1+\frac{bx^2}{a}}}-\frac{3a^{\frac{3}{2}}cx}{8b^2\sqrt{1+\frac{bx^2}{a}}}+\frac{5a^{\frac{3}{2}}dx^3}{48b^2\sqrt{1+\frac{bx^2}{a}}}$$
$$+\frac{7a^{\frac{3}{2}}ex^5}{192b^2\sqrt{1+\frac{bx^2}{a}}}+\frac{3a^{\frac{3}{2}}fx^7}{160b^2\sqrt{1+\frac{bx^2}{a}}}-\frac{\sqrt{a}\,cx^3}{8b\sqrt{1+\frac{bx^2}{a}}}-\frac{\sqrt{a}\,dx^5}{24b\sqrt{1+\frac{bx^2}{a}}}$$
$$-\frac{\sqrt{a}\,ex^7}{48b\sqrt{1+\frac{bx^2}{a}}}-\frac{\sqrt{a}\,fx^9}{80b\sqrt{1+\frac{bx^2}{a}}}-\frac{63a^5f\operatorname{asinh}\left(\frac{\sqrt{b}\,x}{\sqrt{a}}\right)}{256b^{\frac{11}{2}}}$$
$$+\frac{35a^4e\operatorname{asinh}\left(\frac{\sqrt{b}\,x}{\sqrt{a}}\right)}{128b^{\frac{9}{2}}}-\frac{5a^3d\operatorname{asinh}\left(\frac{\sqrt{b}\,x}{\sqrt{a}}\right)}{16b^{\frac{7}{2}}}+\frac{3a^2c\operatorname{asinh}\left(\frac{\sqrt{b}\,x}{\sqrt{a}}\right)}{8b^{\frac{5}{2}}}$$
$$+\frac{cx^5}{4\sqrt{a}\sqrt{1+\frac{bx^2}{a}}}+\frac{dx^7}{6\sqrt{a}\sqrt{1+\frac{bx^2}{a}}}+\frac{ex^9}{8\sqrt{a}\sqrt{1+\frac{bx^2}{a}}}+\frac{fx^{11}}{10\sqrt{a}\sqrt{1+\frac{bx^2}{a}}}$$

13 Test file number 25

Test folder name:

`test_cases/1_Algebraic_functions/1.1_Binomial_products/1.1.3_General/25_1.1.3.2-c_x-^m-a+b_x^n-^p`

13.1 Problem number 1309

$$\int \frac{x^{13/2}}{\sqrt{a+bx^5}}\,dx$$

Optimal antiderivative

$$-\frac{a\operatorname{arctanh}\left(\frac{x^{\frac{5}{2}}\sqrt{b}}{\sqrt{b\,x^5+a}}\right)}{5b^{\frac{3}{2}}}+\frac{x^{\frac{5}{2}}\sqrt{b\,x^5+a}}{5b}$$

command

```
integrate(x**(13/2)/(b*x**5+a)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: SystemError

Sympy 1.8 under Python 3.8.8 output

$$\frac{\sqrt{a}\, x^{\frac{5}{2}} \sqrt{1+\frac{bx^5}{a}}}{5b} - \frac{a \operatorname{asinh}\left(\frac{\sqrt{b}\, x^{\frac{5}{2}}}{\sqrt{a}}\right)}{5b^{\frac{3}{2}}}$$

13.2 Problem number 1314

$$\int \frac{x^{13/2}}{\sqrt{1+x^5}}\, dx$$

Optimal antiderivative

$$-\frac{\operatorname{arcsinh}\left(x^{\frac{5}{2}}\right)}{5} + \frac{x^{\frac{5}{2}} \sqrt{x^5+1}}{5}$$

command

```
integrate(x**(13/2)/(x**5+1)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: SystemError

Sympy 1.8 under Python 3.8.8 output

$$\frac{x^{\frac{5}{2}} \sqrt{x^5+1}}{5} - \frac{\operatorname{asinh}\left(x^{\frac{5}{2}}\right)}{5}$$

13.3 Problem number 1760

$$\int \left(a+\frac{b}{x}\right)^{3/2} x^{9/2}\, dx$$

Optimal antiderivative

$$-\frac{32b^3\left(a+\frac{b}{x}\right)^{\frac{5}{2}} x^{\frac{5}{2}}}{1155a^4} + \frac{16b^2\left(a+\frac{b}{x}\right)^{\frac{5}{2}} x^{\frac{7}{2}}}{231a^3} - \frac{4b\left(a+\frac{b}{x}\right)^{\frac{5}{2}} x^{\frac{9}{2}}}{33a^2} + \frac{2\left(a+\frac{b}{x}\right)^{\frac{5}{2}} x^{\frac{11}{2}}}{11a}$$

command

```
integrate((a+b/x)**(3/2)*x**(9/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: SystemError

Sympy 1.8 under Python 3.8.8 output

$$\frac{210a^8b^{\frac{19}{2}}x^8\sqrt{\frac{ax}{b}+1}}{1155a^7b^9x^3+3465a^6b^{10}x^2+3465a^5b^{11}x+1155a^4b^{12}}+\frac{910a^7b^{\frac{21}{2}}x^7\sqrt{\frac{ax}{b}+1}}{1155a^7b^9x^3+3465a^6b^{10}x^2+3465a^5b^{11}x+1155a^4b^{12}}+\frac{1480a^6b^{\frac{23}{2}}x^6\sqrt{\frac{ax}{b}+1}}{1155a^7b^9x^3+3465a^6b^{10}x^2+3465a^5b^{11}x+1155a^4b^{12}}+\frac{1068a^5b^{\frac{25}{2}}x^5\sqrt{\frac{ax}{b}+1}}{1155a^7b^9x^3+3465a^6b^{10}x^2+3465a^5b^{11}x+1155a^4b^{12}}+\frac{290a^4b^{\frac{27}{2}}x^4\sqrt{\frac{ax}{b}+1}}{1155a^7b^9x^3+3465a^6b^{10}x^2+3465a^5b^{11}x+1155a^4b^{12}}-\frac{10a^3b^{\frac{29}{2}}x^3\sqrt{\frac{ax}{b}+1}}{1155a^7b^9x^3+3465a^6b^{10}x^2+3465a^5b^{11}x+1155a^4b^{12}}-\frac{60a^2b^{\frac{31}{2}}x^2\sqrt{\frac{ax}{b}+1}}{1155a^7b^9x^3+3465a^6b^{10}x^2+3465a^5b^{11}x+1155a^4b^{12}}-\frac{80ab^{\frac{33}{2}}x\sqrt{\frac{ax}{b}+1}}{1155a^7b^9x^3+3465a^6b^{10}x^2+3465a^5b^{11}x+1155a^4b^{12}}-\frac{32b^{\frac{35}{2}}\sqrt{\frac{ax}{b}+1}}{1155a^7b^9x^3+3465a^6b^{10}x^2+3465a^5b^{11}x+1155a^4b^{12}}$$

13.4 Problem number 2357

$$\int \frac{x^2}{a+b\sqrt[3]{x}}\,dx$$

Optimal antiderivative

$$-\frac{3a^7x^{\frac{1}{3}}}{b^8}+\frac{3a^6x^{\frac{2}{3}}}{2b^7}-\frac{a^5x}{b^6}+\frac{3a^4x^{\frac{4}{3}}}{4b^5}-\frac{3a^3x^{\frac{5}{3}}}{5b^4}+\frac{a^2x^2}{2b^3}-\frac{3a\,x^{\frac{7}{3}}}{7b^2}+\frac{3x^{\frac{8}{3}}}{8b}+\frac{3a^8\ln\left(a+b\,x^{\frac{1}{3}}\right)}{b^9}$$

command

```
integrate(x**2/(a+b*x**(1/3)),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{3a^8 \log\left(1+\frac{b\sqrt[3]{x}}{a}\right)}{b^9}-\frac{3a^7\sqrt[3]{x}}{b^8}+\frac{3a^6x^{\frac{2}{3}}}{2b^7}-\frac{a^5x}{b^6}+\frac{3a^4x^{\frac{4}{3}}}{4b^5}-\frac{3a^3x^{\frac{5}{3}}}{5b^4}+\frac{a^2x^2}{2b^3}-\frac{3ax^{\frac{7}{3}}}{7b^2}+\frac{3x^{\frac{8}{3}}}{8b}$$

13.5 Problem number 2366

$$\int \frac{x^2}{\left(a+b\sqrt[3]{x}\right)^2}\,dx$$

Optimal antiderivative

$$-\frac{3a^8}{b^9\left(a+b\,x^{\frac{1}{3}}\right)}+\frac{21a^6x^{\frac{1}{3}}}{b^8}-\frac{9a^5x^{\frac{2}{3}}}{b^7}+\frac{5a^4x}{b^6}-\frac{3a^3x^{\frac{4}{3}}}{b^5}+\frac{9a^2x^{\frac{5}{3}}}{5b^4}-\frac{a\,x^2}{b^3}+\frac{3x^{\frac{7}{3}}}{7b^2}-\frac{24a^7\ln\left(a+b\,x^{\frac{1}{3}}\right)}{b^9}$$

command

```
integrate(x**2/(a+b*x**(1/3))**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\begin{aligned}&-\frac{840a^8x^{\frac{176}{3}}\log\left(1+\frac{b\sqrt[3]{x}}{a}\right)}{35ab^9x^{\frac{176}{3}}+35b^{10}x^{59}}-\frac{840a^7bx^{59}\log\left(1+\frac{b\sqrt[3]{x}}{a}\right)}{35ab^9x^{\frac{176}{3}}+35b^{10}x^{59}}\\&+\frac{840a^7bx^{59}}{35ab^9x^{\frac{176}{3}}+35b^{10}x^{59}}+\frac{420a^6b^2x^{\frac{178}{3}}}{35ab^9x^{\frac{176}{3}}+35b^{10}x^{59}}-\frac{140a^5b^3x^{\frac{179}{3}}}{35ab^9x^{\frac{176}{3}}+35b^{10}x^{59}}\\&+\frac{70a^4b^4x^{60}}{35ab^9x^{\frac{176}{3}}+35b^{10}x^{59}}-\frac{42a^3b^5x^{\frac{181}{3}}}{35ab^9x^{\frac{176}{3}}+35b^{10}x^{59}}+\frac{28a^2b^6x^{\frac{182}{3}}}{35ab^9x^{\frac{176}{3}}+35b^{10}x^{59}}\\&-\frac{20ab^7x^{61}}{35ab^9x^{\frac{176}{3}}+35b^{10}x^{59}}+\frac{15b^8x^{\frac{184}{3}}}{35ab^9x^{\frac{176}{3}}+35b^{10}x^{59}}\end{aligned}$$

14 Test file number 26

Test folder name:

`test_cases/1_Algebraic_functions/1.1_Binomial_products/1.1.3_General/26_1.1.3.3-a+b_x^n-^p-c+d_x^n-^q`

14.1 Problem number 18

$$\int \frac{1}{(a+bx^3)\,(c+dx^3)}\,dx$$

Optimal antiderivative

$$\frac{b^{\frac{2}{3}}\ln\left(a^{\frac{1}{3}}+b^{\frac{1}{3}}x\right)}{3a^{\frac{2}{3}}\,(-ad+bc)}-\frac{d^{\frac{2}{3}}\ln\left(c^{\frac{1}{3}}+d^{\frac{1}{3}}x\right)}{3c^{\frac{2}{3}}\,(-ad+bc)}-\frac{b^{\frac{2}{3}}\ln\left(a^{\frac{2}{3}}-a^{\frac{1}{3}}b^{\frac{1}{3}}x+b^{\frac{2}{3}}x^2\right)}{6a^{\frac{2}{3}}\,(-ad+bc)}$$
$$+\frac{d^{\frac{2}{3}}\ln\left(c^{\frac{2}{3}}-c^{\frac{1}{3}}d^{\frac{1}{3}}x+d^{\frac{2}{3}}x^2\right)}{6c^{\frac{2}{3}}\,(-ad+bc)}-\frac{b^{\frac{2}{3}}\arctan\left(\frac{\left(a^{\frac{1}{3}}-2b^{\frac{1}{3}}x\right)\sqrt{3}}{3a^{\frac{1}{3}}}\right)\sqrt{3}}{3a^{\frac{2}{3}}\,(-ad+bc)}$$
$$+\frac{d^{\frac{2}{3}}\arctan\left(\frac{\left(c^{\frac{1}{3}}-2d^{\frac{1}{3}}x\right)\sqrt{3}}{3c^{\frac{1}{3}}}\right)\sqrt{3}}{3c^{\frac{2}{3}}\,(-ad+bc)}$$

command

```
integrate(1/(b*x**3+a)/(d*x**3+c),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\text{RootSum}\left(t^3\left(27a^5d^3-81a^4bcd^2+81a^3b^2c^2d-27a^2b^3c^3\right)+b^2,\left(t\mapsto t\log\left(x+\frac{81t^4a^7c^2d^5-243t^4a^6bc^3d^4+162\right.\right.\right.$$
$$+\text{RootSum}\left(t^3\left(27a^3c^2d^3-81a^2bc^3d^2+81ab^2c^4d-27b^3c^5\right)-d^2,\left(t\mapsto t\log\left(x+\frac{81t^4a^7c^2d^5-243t^4a^6bc^3d^4+16\right.\right.\right.$$

14.2 Problem number 167

$$\int \frac{\left(c+dx^4\right)^4}{\left(a+bx^4\right)^2}\,dx$$

Optimal antiderivative

$$\frac{d^2\left(3a^2d^2-8abcd+6b^2c^2\right)x}{b^4}+\frac{2d^3(-ad+2bc)\,x^5}{5b^3}+\frac{d^4x^9}{9b^2}+\frac{(-ad+bc)^4\,x}{4a\,b^4\left(b\,x^4+a\right)}$$
$$+\frac{(-ad+bc)^3\,(13ad+3bc)\arctan\left(-1+\frac{b^{\frac{1}{4}}x\sqrt{2}}{a^{\frac{1}{4}}}\right)\sqrt{2}}{16a^{\frac{7}{4}}b^{\frac{17}{4}}}$$
$$+\frac{(-ad+bc)^3\,(13ad+3bc)\arctan\left(1+\frac{b^{\frac{1}{4}}x\sqrt{2}}{a^{\frac{1}{4}}}\right)\sqrt{2}}{16a^{\frac{7}{4}}b^{\frac{17}{4}}}$$
$$-\frac{(-ad+bc)^3\,(13ad+3bc)\ln\left(-a^{\frac{1}{4}}b^{\frac{1}{4}}x\sqrt{2}+\sqrt{a}+x^2\sqrt{b}\right)\sqrt{2}}{32a^{\frac{7}{4}}b^{\frac{17}{4}}}$$
$$+\frac{(-ad+bc)^3\,(13ad+3bc)\ln\left(a^{\frac{1}{4}}b^{\frac{1}{4}}x\sqrt{2}+\sqrt{a}+x^2\sqrt{b}\right)\sqrt{2}}{32a^{\frac{7}{4}}b^{\frac{17}{4}}}$$

command

```
integrate((d*x**4+c)**4/(b*x**4+a)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$x^5\left(-\frac{2ad^4}{5b^3}+\frac{4cd^3}{5b^2}\right)+x\left(\frac{3a^2d^4}{b^4}-\frac{8acd^3}{b^3}+\frac{6c^2d^2}{b^2}\right)$$
$$+\frac{x\left(a^4d^4-4a^3bcd^3+6a^2b^2c^2d^2-4ab^3c^3d+b^4c^4\right)}{4a^2b^4+4ab^5x^4}$$
$$+\text{RootSum}\left(65536t^4a^7b^{17}+28561a^{16}d^{16}-316368a^{15}bcd^{15}+1577784a^{14}b^2c^2d^{14}-4651504a^{13}b^3c^3d^{13}+8923164a\right.$$
$$+\frac{d^4x^9}{9b^2}$$

14.3 Problem number 290

$$\int \frac{a+bx^n}{(c+dx^n)^3}\,dx$$

Optimal antiderivative

$$-\frac{(-ad+bc)\,x}{2cdn\left(c+d\,x^n\right)^2}+\frac{(bc-ad(1-2n))\,x\,\text{hypergeom}\left(\left[2,\frac{1}{n}\right],\left[1+\frac{1}{n}\right],-\frac{d\,x^n}{c}\right)}{2c^3dn}$$

command

```
integrate((a+b*x**n)/(c+d*x**n)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

output too large to display

14.4 Problem number 352

$$\int \frac{a+bx^2}{\sqrt{-1+cx}\,\sqrt{1+cx}}\,dx$$

Optimal antiderivative

$$\frac{\left(2a\,c^2+b\right)\text{arccosh}(cx)}{2c^3}+\frac{bx\sqrt{cx-1}\,\sqrt{cx+1}}{2c^2}$$

command

```
integrate((b*x**2+a)/(c*x-1)**(1/2)/(c*x+1)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{aG_{6,6}^{6,2}\left(\begin{matrix}\frac{1}{4},\frac{3}{4} & \frac{1}{2},\frac{1}{2},1,1\\ 0,\frac{1}{4},\frac{1}{2},\frac{3}{4},1,0 & \end{matrix}\middle|\frac{1}{c^2x^2}\right)}{4\pi^{\frac{3}{2}}c}-\frac{iaG_{6,6}^{2,6}\left(\begin{matrix}-\frac{1}{2},-\frac{1}{4},0,\frac{1}{4},\frac{1}{2},1 & \\ -\frac{1}{4},\frac{1}{4} & -\frac{1}{2},0,0,0\end{matrix}\middle|\frac{e^{2i\pi}}{c^2x^2}\right)}{4\pi^{\frac{3}{2}}c}$$
$$+\frac{bG_{6,6}^{6,2}\left(\begin{matrix}-\frac{3}{4},-\frac{1}{4} & -\frac{1}{2},-\frac{1}{2},0,1\\ -1,-\frac{3}{4},-\frac{1}{2},-\frac{1}{4},0,0 & \end{matrix}\middle|\frac{1}{c^2x^2}\right)}{4\pi^{\frac{3}{2}}c^3}$$
$$-\frac{ibG_{6,6}^{2,6}\left(\begin{matrix}-\frac{3}{2},-\frac{5}{4},-1,-\frac{3}{4},-\frac{1}{2},1 & \\ -\frac{5}{4},-\frac{3}{4} & -\frac{3}{2},-1,-1,0\end{matrix}\middle|\frac{e^{2i\pi}}{c^2x^2}\right)}{4\pi^{\frac{3}{2}}c^3}$$

14.5 Problem number 355

$$\int \frac{a+bx^2}{x^3\sqrt{-1+cx}\,\sqrt{1+cx}}\,dx$$

Optimal antiderivative

$$\frac{\left(a\,c^2+2b\right)\arctan\left(\sqrt{cx-1}\,\sqrt{cx+1}\right)}{2}+\frac{a\sqrt{cx-1}\,\sqrt{cx+1}}{2x^2}$$

command

```
integrate((b*x**2+a)/x**3/(c*x-1)**(1/2)/(c*x+1)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{ac^2G_{6,6}^{5,3}\left(\begin{matrix}\frac{7}{4},\frac{9}{4},1 & 2,2,\frac{5}{2}\\ \frac{3}{2},\frac{7}{4},2,\frac{9}{4},\frac{5}{2} & 0\end{matrix}\middle|\frac{1}{c^2x^2}\right)}{4\pi^{\frac{3}{2}}}+\frac{iac^2G_{6,6}^{2,6}\left(\begin{matrix}1,\frac{5}{4},\frac{3}{2},\frac{7}{4},2,1 & \\ \frac{5}{4},\frac{7}{4} & 1,\frac{3}{2},\frac{3}{2},0\end{matrix}\middle|\frac{e^{2i\pi}}{c^2x^2}\right)}{4\pi^{\frac{3}{2}}}$$
$$-\frac{bG_{6,6}^{5,3}\left(\begin{matrix}\frac{3}{4},\frac{5}{4},1 & 1,1,\frac{3}{2}\\ \frac{1}{2},\frac{3}{4},1,\frac{5}{4},\frac{3}{2} & 0\end{matrix}\middle|\frac{1}{c^2x^2}\right)}{4\pi^{\frac{3}{2}}}+\frac{ibG_{6,6}^{2,6}\left(\begin{matrix}0,\frac{1}{4},\frac{1}{2},\frac{3}{4},1,1 & \\ \frac{1}{4},\frac{3}{4} & 0,\frac{1}{2},\frac{1}{2},0\end{matrix}\middle|\frac{e^{2i\pi}}{c^2x^2}\right)}{4\pi^{\frac{3}{2}}}$$

14.6 Problem number 362

$$\int \frac{a+bx^2}{\sqrt{-c+dx}\,\sqrt{c+dx}}\,dx$$

Optimal antiderivative

$$\frac{\left(2a\,d^2+b\,c^2\right)\operatorname{arctanh}\left(\frac{\sqrt{dx-c}}{\sqrt{dx+c}}\right)}{d^3}+\frac{bx\sqrt{dx-c}\,\sqrt{dx+c}}{2d^2}$$

command

```
integrate((b*x**2+a)/(d*x-c)**(1/2)/(d*x+c)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{aG_{6,6}^{6,2}\left(\begin{matrix}\frac{1}{4},\frac{3}{4} & \frac{1}{2},\frac{1}{2},1,1\\ 0,\frac{1}{4},\frac{1}{2},\frac{3}{4},1,0\end{matrix}\middle|\frac{c^2}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d}-\frac{iaG_{6,6}^{2,6}\left(\begin{matrix}-\frac{1}{2},-\frac{1}{4},0,\frac{1}{4},\frac{1}{2},1\\ -\frac{1}{4},\frac{1}{4}\end{matrix}\middle|\frac{c^2e^{2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d}$$
$$+\frac{bc^2G_{6,6}^{6,2}\left(\begin{matrix}-\frac{3}{4},-\frac{1}{4} & -\frac{1}{2},-\frac{1}{2},0,1\\ -1,-\frac{3}{4},-\frac{1}{2},-\frac{1}{4},0,0\end{matrix}\middle|\frac{c^2}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^3}$$
$$-\frac{ibc^2G_{6,6}^{2,6}\left(\begin{matrix}-\frac{3}{2},-\frac{5}{4},-1,-\frac{3}{4},-\frac{1}{2},1\\ -\frac{5}{4},-\frac{3}{4}\end{matrix}\middle|\frac{c^2e^{2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}d^3}$$

14.7 Problem number 365

$$\int \frac{a+bx^2}{x^3\sqrt{-c+dx}\,\sqrt{c+dx}}\,dx$$

Optimal antiderivative

$$\frac{\left(a\,d^2+2b\,c^2\right)\arctan\left(\frac{\sqrt{dx-c}\,\sqrt{dx+c}}{c}\right)}{2c^3}+\frac{a\sqrt{dx-c}\,\sqrt{dx+c}}{2c^2x^2}$$

command

```
integrate((b*x**2+a)/x**3/(d*x-c)**(1/2)/(d*x+c)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{ad^2G_{6,6}^{5,3}\left(\begin{matrix}\frac{7}{4},\frac{9}{4},1 & 2,2,\frac{5}{2}\\ \frac{3}{2},\frac{7}{4},2,\frac{9}{4},\frac{5}{2} & 0\end{matrix}\middle|\frac{c^2}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}c^3}+\frac{iad^2G_{6,6}^{2,6}\left(\begin{matrix}1,\frac{5}{4},\frac{3}{2},\frac{7}{4},2,1 & \\ \frac{5}{4},\frac{7}{4} & 1,\frac{3}{2},\frac{3}{2},0\end{matrix}\middle|\frac{c^2e^{2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}c^3}$$
$$-\frac{bG_{6,6}^{5,3}\left(\begin{matrix}\frac{3}{4},\frac{5}{4},1 & 1,1,\frac{3}{2}\\ \frac{1}{2},\frac{3}{4},1,\frac{5}{4},\frac{3}{2} & 0\end{matrix}\middle|\frac{c^2}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}c}+\frac{ibG_{6,6}^{2,6}\left(\begin{matrix}0,\frac{1}{4},\frac{1}{2},\frac{3}{4},1,1 & \\ \frac{1}{4},\frac{3}{4} & 0,\frac{1}{2},\frac{1}{2},0\end{matrix}\middle|\frac{c^2e^{2i\pi}}{d^2x^2}\right)}{4\pi^{\frac{3}{2}}c}$$

14.8 Problem number 369

$$\int \frac{x^3\left(a+bx^2\right)}{(-c+dx)^{3/2}(c+dx)^{3/2}}\,dx$$

Optimal antiderivative

$$-\frac{\left(3a\,d^2+4b\,c^2\right)x^2}{3d^4\sqrt{dx-c}\,\sqrt{dx+c}}+\frac{b\,x^4}{3d^2\sqrt{dx-c}\,\sqrt{dx+c}}+\frac{2\left(3a\,d^2+4b\,c^2\right)\sqrt{dx-c}\,\sqrt{dx+c}}{3d^6}$$

command

```
integrate(x**3*(b*x**2+a)/(d*x-c)**(3/2)/(d*x+c)**(3/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$a\left(\frac{cG_{6,6}^{6,2}\left(\begin{matrix}-\frac{3}{4},-\frac{1}{4} & -1,0,\frac{1}{2},1\\ -\frac{3}{4},-\frac{1}{2},-\frac{1}{4},0,\frac{1}{2},0 & \end{matrix}\middle|\frac{c^2}{d^2x^2}\right)}{2\pi^{\frac{3}{2}}d^4}\right.$$

$$\left.-\frac{icG_{6,6}^{2,6}\left(\begin{matrix}-2,-\frac{3}{2},-\frac{5}{4},-1,-\frac{3}{4},1 & \\ -\frac{5}{4},-\frac{3}{4} & -2,-\frac{3}{2},-\frac{1}{2},0\end{matrix}\middle|\frac{c^2e^{2i\pi}}{d^2x^2}\right)}{2\pi^{\frac{3}{2}}d^4}\right)$$

$$+b\left(\frac{c^3G_{6,6}^{6,2}\left(\begin{matrix}-\frac{7}{4},-\frac{5}{4} & -2,-1,-\frac{1}{2},1\\ -\frac{7}{4},-\frac{3}{2},-\frac{5}{4},-1,-\frac{1}{2},0 & \end{matrix}\middle|\frac{c^2}{d^2x^2}\right)}{2\pi^{\frac{3}{2}}d^6}\right.$$

$$\left.-\frac{ic^3G_{6,6}^{2,6}\left(\begin{matrix}-3,-\frac{5}{2},-\frac{9}{4},-2,-\frac{7}{4},1 & \\ -\frac{9}{4},-\frac{7}{4} & -3,-\frac{5}{2},-\frac{3}{2},0\end{matrix}\middle|\frac{c^2e^{2i\pi}}{d^2x^2}\right)}{2\pi^{\frac{3}{2}}d^6}\right)$$

14.9 Problem number 371

$$\int \frac{x\left(a+bx^2\right)}{(-c+dx)^{3/2}(c+dx)^{3/2}}\,dx$$

Optimal antiderivative

$$-\frac{\left(\frac{a}{c^2}+\frac{b}{d^2}\right)x^2}{\sqrt{dx-c}\,\sqrt{dx+c}}+\frac{\left(a\,d^2+2b\,c^2\right)\sqrt{dx-c}\,\sqrt{dx+c}}{c^2d^4}$$

command

```
integrate(x*(b*x**2+a)/(d*x-c)**(3/2)/(d*x+c)**(3/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$a\left(-\frac{G_{6,6}^{5,3}\left(\begin{matrix}\frac{1}{4},\frac{3}{4},1 & 0,1,\frac{3}{2}\\ \frac{1}{4},\frac{1}{2},\frac{3}{4},1,\frac{3}{2} & 0\end{matrix}\middle|\frac{c^2}{d^2x^2}\right)}{2\pi^{\frac{3}{2}}cd^2}-\frac{iG_{6,6}^{2,6}\left(\begin{matrix}-1,-\frac{1}{2},-\frac{1}{4},0,\frac{1}{4},1 & \\ -\frac{1}{4},\frac{1}{4} & -1,-\frac{1}{2},\frac{1}{2},0\end{matrix}\middle|\frac{c^2e^{2i\pi}}{d^2x^2}\right)}{2\pi^{\frac{3}{2}}cd^2}\right)$$
$$+b\left(\frac{cG_{6,6}^{6,2}\left(\begin{matrix}-\frac{3}{4},-\frac{1}{4} & -1,0,\frac{1}{2},1\\ -\frac{3}{4},-\frac{1}{2},-\frac{1}{4},0,\frac{1}{2},0 & \end{matrix}\middle|\frac{c^2}{d^2x^2}\right)}{2\pi^{\frac{3}{2}}d^4}\right.$$
$$\left.-\frac{icG_{6,6}^{2,6}\left(\begin{matrix}-2,-\frac{3}{2},-\frac{5}{4},-1,-\frac{3}{4},1 & \\ -\frac{5}{4},-\frac{3}{4} & -2,-\frac{3}{2},-\frac{1}{2},0\end{matrix}\middle|\frac{c^2e^{2i\pi}}{d^2x^2}\right)}{2\pi^{\frac{3}{2}}d^4}\right)$$

14.10 Problem number 372

$$\int \frac{a+bx^2}{(-c+dx)^{3/2}(c+dx)^{3/2}}\,dx$$

Optimal antiderivative

$$\frac{2b\operatorname{arctanh}\left(\frac{\sqrt{dx-c}}{\sqrt{dx+c}}\right)}{d^3}-\frac{\left(\frac{a}{c^2}+\frac{b}{d^2}\right)x}{\sqrt{dx-c}\,\sqrt{dx+c}}$$

command

```
integrate((b*x**2+a)/(d*x-c)**(3/2)/(d*x+c)**(3/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$a\left(-\frac{G_{6,6}^{5,3}\left(\begin{matrix}\frac{3}{4},\frac{5}{4},1 & \frac{1}{2},\frac{3}{2},2\\ \frac{3}{4},1,\frac{5}{4},\frac{3}{2},2 & 0\end{matrix}\middle|\frac{c^2}{d^2x^2}\right)}{2\pi^{\frac{3}{2}}c^2d}+\frac{iG_{6,6}^{2,6}\left(\begin{matrix}-\frac{1}{2},0,\frac{1}{4},\frac{1}{2},\frac{3}{4},1\\ \frac{1}{4},\frac{3}{4}\end{matrix}\middle|\frac{c^2e^{2i\pi}}{d^2x^2}\right)}{2\pi^{\frac{3}{2}}c^2d}\right)$$

$$+b\left(\frac{G_{6,6}^{6,2}\left(\begin{matrix}-\frac{1}{4},\frac{1}{4} & -\frac{1}{2},\frac{1}{2},1,1\\ -\frac{1}{4},0,\frac{1}{4},\frac{1}{2},1,0\end{matrix}\middle|\frac{c^2}{d^2x^2}\right)}{2\pi^{\frac{3}{2}}d^3}\right.$$

$$\left.+\frac{iG_{6,6}^{2,6}\left(\begin{matrix}-\frac{3}{2},-1,-\frac{3}{4},-\frac{1}{2},-\frac{1}{4},1\\ -\frac{3}{4},-\frac{1}{4}\end{matrix}\middle|\frac{c^2e^{2i\pi}}{d^2x^2}\right)}{2\pi^{\frac{3}{2}}d^3}\right)$$

14.11 Problem number 373

$$\int \frac{a+bx^2}{x(-c+dx)^{3/2}(c+dx)^{3/2}}\,dx$$

Optimal antiderivative

$$-\frac{a\arctan\left(\frac{\sqrt{dx-c}\,\sqrt{dx+c}}{c}\right)}{c^3}+\frac{-\frac{a}{c^2}-\frac{b}{d^2}}{\sqrt{dx-c}\,\sqrt{dx+c}}$$

command

```
integrate((b*x**2+a)/x/(d*x-c)**(3/2)/(d*x+c)**(3/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$a\left(-\frac{G_{6,6}^{5,3}\left(\begin{matrix}\frac{5}{4},\frac{7}{4},1 & 1,2,\frac{5}{2}\\ \frac{5}{4},\frac{3}{2},\frac{7}{4},2,\frac{5}{2} & 0\end{matrix}\middle|\frac{c^2}{d^2x^2}\right)}{2\pi^{\frac{3}{2}}c^3}-\frac{iG_{6,6}^{2,6}\left(\begin{matrix}0,\frac{1}{2},\frac{3}{4},1,\frac{5}{4},1 & \\ \frac{3}{4},\frac{5}{4} & 0,\frac{1}{2},\frac{3}{2},0\end{matrix}\middle|\frac{c^2e^{2i\pi}}{d^2x^2}\right)}{2\pi^{\frac{3}{2}}c^3}\right)$$
$$+b\left(-\frac{G_{6,6}^{5,3}\left(\begin{matrix}\frac{1}{4},\frac{3}{4},1 & 0,1,\frac{3}{2}\\ \frac{1}{4},\frac{1}{2},\frac{3}{4},1,\frac{3}{2} & 0\end{matrix}\middle|\frac{c^2}{d^2x^2}\right)}{2\pi^{\frac{3}{2}}cd^2}-\frac{iG_{6,6}^{2,6}\left(\begin{matrix}-1,-\frac{1}{2},-\frac{1}{4},0,\frac{1}{4},1 & \\ -\frac{1}{4},\frac{1}{4} & -1,-\frac{1}{2},\frac{1}{2},0\end{matrix}\middle|\frac{c^2e^{2i\pi}}{d^2x^2}\right)}{2\pi^{\frac{3}{2}}cd^2}\right)$$

14.12 Problem number 374

$$\int \frac{a+bx^2}{x^2(-c+dx)^{3/2}(c+dx)^{3/2}}\,dx$$

Optimal antiderivative

$$\frac{a}{c^2x\sqrt{dx-c}\,\sqrt{dx+c}}-\frac{\left(2a\,d^2+b\,c^2\right)x}{c^4\sqrt{dx-c}\,\sqrt{dx+c}}$$

command

```
integrate((b*x**2+a)/x**2/(d*x-c)**(3/2)/(d*x+c)**(3/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$a\left(-\frac{dG_{6,6}^{5,3}\left(\begin{matrix}\frac{7}{4},\frac{9}{4},1 & \frac{3}{2},\frac{5}{2},3\\ \frac{7}{4},2,\frac{9}{4},\frac{5}{2},3 & 0\end{matrix}\middle|\frac{c^2}{d^2x^2}\right)}{2\pi^{\frac{3}{2}}c^4}+\frac{idG_{6,6}^{2,6}\left(\begin{matrix}\frac{1}{2},1,\frac{5}{4},\frac{3}{2},\frac{7}{4},1 & \\ \frac{5}{4},\frac{7}{4} & \frac{1}{2},1,2,0\end{matrix}\middle|\frac{c^2e^{2i\pi}}{d^2x^2}\right)}{2\pi^{\frac{3}{2}}c^4}\right)$$
$$+b\left(-\frac{G_{6,6}^{5,3}\left(\begin{matrix}\frac{3}{4},\frac{5}{4},1 & \frac{1}{2},\frac{3}{2},2\\ \frac{3}{4},1,\frac{5}{4},\frac{3}{2},2 & 0\end{matrix}\middle|\frac{c^2}{d^2x^2}\right)}{2\pi^{\frac{3}{2}}c^2d}+\frac{iG_{6,6}^{2,6}\left(\begin{matrix}-\frac{1}{2},0,\frac{1}{4},\frac{1}{2},\frac{3}{4},1 & \\ \frac{1}{4},\frac{3}{4} & -\frac{1}{2},0,1,0\end{matrix}\middle|\frac{c^2e^{2i\pi}}{d^2x^2}\right)}{2\pi^{\frac{3}{2}}c^2d}\right)$$

15 Test file number 27

Test folder name:

`test_cases/1_Algebraic_functions/1.1_Binomial_products/1.1.3_General/27_1.1.3.4-e_x-^m-a+b_x^n-^p-c+d_x^n-^q`

15.1 Problem number 46

$$\int \frac{(a+bx^3)^5\,(A+Bx^3)}{x^{14}}\,dx$$

Optimal antiderivative

$$-\frac{a^5A}{13x^{13}}-\frac{a^4(5Ab+aB)}{10x^{10}}-\frac{5a^3b(2Ab+aB)}{7x^7}-\frac{5a^2b^2(Ab+aB)}{2x^4}$$
$$-\frac{5a\,b^3(Ab+2aB)}{x}+\frac{b^4(Ab+5aB)\,x^2}{2}+\frac{b^5B\,x^5}{5}$$

command

```
integrate((b*x**3+a)**5*(B*x**3+A)/x**14,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{Bb^5x^5}{5}+x^2\left(\frac{Ab^5}{2}+\frac{5Bab^4}{2}\right)$$
$$+\frac{-70Aa^5+x^{12}\left(-4550Aab^4-9100Ba^2b^3\right)+x^9\left(-2275Aa^2b^3-2275Ba^3b^2\right)+x^6\left(-1300Aa^3b^2-650Ba^4b\right)+x^3(}{910x^{13}}$$

15.2 Problem number 47

$$\int \frac{(a+bx^3)^5\,(A+Bx^3)}{x^{15}}\,dx$$

Optimal antiderivative

$$-\frac{a^5A}{14x^{14}}-\frac{a^4(5Ab+aB)}{11x^{11}}-\frac{5a^3b(2Ab+aB)}{8x^8}-\frac{2a^2b^2(Ab+aB)}{x^5}$$
$$-\frac{5a\,b^3(Ab+2aB)}{2x^2}+b^4(Ab+5aB)\,x+\frac{b^5B\,x^4}{4}$$

command

```
integrate((b*x**3+a)**5*(B*x**3+A)/x**15,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{Bb^5x^4}{4}+x\left(Ab^5+5Bab^4\right)\\+\frac{-44Aa^5+x^{12}\left(-1540Aab^4-3080Ba^2b^3\right)+x^9\left(-1232Aa^2b^3-1232Ba^3b^2\right)+x^6\left(-770Aa^3b^2-385Ba^4b\right)+x^3\left(-}{616x^{14}}$$

15.3 Problem number 48

$$\int \frac{\left(a+bx^3\right)^5\left(A+Bx^3\right)}{x^{16}}\,dx$$

Optimal antiderivative

$$-\frac{a^5A}{15x^{15}}-\frac{a^4(5Ab+aB)}{12x^{12}}-\frac{5a^3b(2Ab+aB)}{9x^9}-\frac{5a^2b^2(Ab+aB)}{3x^6}\\-\frac{5a\,b^3(Ab+2aB)}{3x^3}+\frac{b^5B\,x^3}{3}+b^4(Ab+5aB)\ln(x)$$

command

```
integrate((b*x**3+a)**5*(B*x**3+A)/x**16,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{Bb^5x^3}{3}+b^4(Ab+5Ba)\log\left(x\right)\\+\frac{-12Aa^5+x^{12}\left(-300Aab^4-600Ba^2b^3\right)+x^9\left(-300Aa^2b^3-300Ba^3b^2\right)+x^6\left(-200Aa^3b^2-100Ba^4b\right)+x^3\left(-75A\right.}{180x^{15}}$$

15.4 Problem number 49

$$\int \frac{\left(a+bx^3\right)^5\left(A+Bx^3\right)}{x^{17}}\,dx$$

Optimal antiderivative

$$-\frac{a^5A}{16x^{16}}-\frac{a^4(5Ab+aB)}{13x^{13}}-\frac{a^3b(2Ab+aB)}{2x^{10}}-\frac{10a^2b^2(Ab+aB)}{7x^7}$$
$$-\frac{5a\,b^3(Ab+2aB)}{4x^4}-\frac{b^4(Ab+5aB)}{x}+\frac{b^5B\,x^2}{2}$$

command

```
integrate((b*x**3+a)**5*(B*x**3+A)/x**17,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{Bb^5x^2}{2}$$
$$+\frac{-91Aa^5+x^{15}\left(-1456Ab^5-7280Bab^4\right)+x^{12}\left(-1820Aab^4-3640Ba^2b^3\right)+x^9\left(-2080Aa^2b^3-2080Ba^3b^2\right)+x^6\left(\right.}{1456x^{16}}$$

15.5 Problem number 111

$$\int \frac{x^4}{\left(a+bx^3\right)\left(c+dx^3\right)}\,dx$$

Optimal antiderivative

$$\frac{a^{\frac{2}{3}}\ln\left(a^{\frac{1}{3}}+b^{\frac{1}{3}}x\right)}{3b^{\frac{2}{3}}\left(-ad+bc\right)}-\frac{c^{\frac{2}{3}}\ln\left(c^{\frac{1}{3}}+d^{\frac{1}{3}}x\right)}{3d^{\frac{2}{3}}\left(-ad+bc\right)}-\frac{a^{\frac{2}{3}}\ln\left(a^{\frac{2}{3}}-a^{\frac{1}{3}}b^{\frac{1}{3}}x+b^{\frac{2}{3}}x^2\right)}{6b^{\frac{2}{3}}\left(-ad+bc\right)}$$
$$+\frac{c^{\frac{2}{3}}\ln\left(c^{\frac{2}{3}}-c^{\frac{1}{3}}d^{\frac{1}{3}}x+d^{\frac{2}{3}}x^2\right)}{6d^{\frac{2}{3}}\left(-ad+bc\right)}+\frac{a^{\frac{2}{3}}\arctan\left(\frac{\left(a^{\frac{1}{3}}-2b^{\frac{1}{3}}x\right)\sqrt{3}}{3a^{\frac{1}{3}}}\right)\sqrt{3}}{3b^{\frac{2}{3}}\left(-ad+bc\right)}$$
$$-\frac{c^{\frac{2}{3}}\arctan\left(\frac{\left(c^{\frac{1}{3}}-2d^{\frac{1}{3}}x\right)\sqrt{3}}{3c^{\frac{1}{3}}}\right)\sqrt{3}}{3d^{\frac{2}{3}}\left(-ad+bc\right)}$$

command

```
integrate(x**4/(b*x**3+a)/(d*x**3+c),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\text{RootSum}\left(t^3\left(27a^3d^5-81a^2bcd^4+81ab^2c^2d^3-27b^3c^3d^2\right)-c^2,\left(t\mapsto t\log\left(x+\frac{243t^5a^6b^2d^8-1458t^5a^5b^3cd^7+3\right.\right.\right.$$
$$+\text{RootSum}\left(t^3\left(27a^3b^2d^3-81a^2b^3cd^2+81ab^4c^2d-27b^5c^3\right)+a^2,\left(t\mapsto t\log\left(x+\frac{243t^5a^6b^2d^8-1458t^5a^5b^3cd^7+\right.\right.\right.$$

15.6 Problem number 115

$$\int\frac{1}{\left(a+bx^3\right)\left(c+dx^3\right)}\,dx$$

Optimal antiderivative

$$\frac{b^{\frac{2}{3}}\ln\left(a^{\frac{1}{3}}+b^{\frac{1}{3}}x\right)}{3a^{\frac{2}{3}}\left(-ad+bc\right)}-\frac{d^{\frac{2}{3}}\ln\left(c^{\frac{1}{3}}+d^{\frac{1}{3}}x\right)}{3c^{\frac{2}{3}}\left(-ad+bc\right)}-\frac{b^{\frac{2}{3}}\ln\left(a^{\frac{2}{3}}-a^{\frac{1}{3}}b^{\frac{1}{3}}x+b^{\frac{2}{3}}x^2\right)}{6a^{\frac{2}{3}}\left(-ad+bc\right)}$$
$$+\frac{d^{\frac{2}{3}}\ln\left(c^{\frac{2}{3}}-c^{\frac{1}{3}}d^{\frac{1}{3}}x+d^{\frac{2}{3}}x^2\right)}{6c^{\frac{2}{3}}\left(-ad+bc\right)}-\frac{b^{\frac{2}{3}}\arctan\left(\frac{\left(a^{\frac{1}{3}}-2b^{\frac{1}{3}}x\right)\sqrt{3}}{3a^{\frac{1}{3}}}\right)\sqrt{3}}{3a^{\frac{2}{3}}\left(-ad+bc\right)}$$
$$+\frac{d^{\frac{2}{3}}\arctan\left(\frac{\left(c^{\frac{1}{3}}-2d^{\frac{1}{3}}x\right)\sqrt{3}}{3c^{\frac{1}{3}}}\right)\sqrt{3}}{3c^{\frac{2}{3}}\left(-ad+bc\right)}$$

command

```
integrate(1/(b*x**3+a)/(d*x**3+c),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\text{RootSum}\left(t^3\left(27a^5d^3-81a^4bcd^2+81a^3b^2c^2d-27a^2b^3c^3\right)+b^2,\left(t\mapsto t\log\left(x+\frac{81t^4a^7c^2d^5-243t^4a^6bc^3d^4+162\right.\right.\right.$$
$$+\text{RootSum}\left(t^3\left(27a^3c^2d^3-81a^2bc^3d^2+81ab^2c^4d-27b^3c^5\right)-d^2,\left(t\mapsto t\log\left(x+\frac{81t^4a^7c^2d^5-243t^4a^6bc^3d^4+16\right.\right.\right.$$

15.7 Problem number 769

$$\int \frac{x^7}{(a+bx^4)\,(c+dx^4)}\,dx$$

Optimal antiderivative

$$-\frac{a\ln\left(b\,x^4+a\right)}{4b\,(-ad+bc)}+\frac{c\ln\left(d\,x^4+c\right)}{4d\,(-ad+bc)}$$

command

```
integrate(x**7/(b*x**4+a)/(d*x**4+c),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{a\log\left(x^4+\frac{\frac{a^3d^2}{b(ad-bc)}-\frac{2a^2cd}{ad-bc}+\frac{abc^2}{ad-bc}+2ac}{ad+bc}\right)}{4b\,(ad-bc)}-\frac{c\log\left(x^4+\frac{-\frac{a^2cd}{ad-bc}+\frac{2abc^2}{ad-bc}+2ac-\frac{b^2c^3}{d(ad-bc)}}{ad+bc}\right)}{4d\,(ad-bc)}$$

15.8 Problem number 774

$$\int \frac{x^9}{(a+bx^4)\,(c+dx^4)}\,dx$$

Optimal antiderivative

$$\frac{x^2}{2bd}+\frac{a^{\frac{3}{2}}\arctan\left(\frac{x^2\sqrt{b}}{\sqrt{a}}\right)}{2b^{\frac{3}{2}}\,(-ad+bc)}-\frac{c^{\frac{3}{2}}\arctan\left(\frac{x^2\sqrt{d}}{\sqrt{c}}\right)}{2d^{\frac{3}{2}}\,(-ad+bc)}$$

command

```
integrate(x**9/(b*x**4+a)/(d*x**4+c),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\sqrt{-\frac{a^3}{b^3}}\log\left(x^2+\frac{-\frac{a^4d^4\sqrt{-\frac{a^3}{b^3}}}{ad-bc}-\frac{a^3b^3d^6\left(-\frac{a^3}{b^3}\right)^{\frac{3}{2}}}{(ad-bc)^3}+\frac{a^2b^4cd^5\left(-\frac{a^3}{b^3}\right)^{\frac{3}{2}}}{(ad-bc)^3}+\frac{ab^5c^2d^4\left(-\frac{a^3}{b^3}\right)^{\frac{3}{2}}}{(ad-bc)^3}-\frac{b^6c^3d^3\left(-\frac{a^3}{b^3}\right)^{\frac{3}{2}}}{(ad-bc)^3}-\frac{b^4c^4\sqrt{-\frac{a^3}{b^3}}}{ad-bc}}{a^3cd^2+a^2bc^2d+ab^2c^3}\right)$$

$$-\frac{}{4(ad-bc)}$$

$$\sqrt{-\frac{a^3}{b^3}}\log\left(x^2+\frac{\frac{a^4d^4\sqrt{-\frac{a^3}{b^3}}}{ad-bc}+\frac{a^3b^3d^6\left(-\frac{a^3}{b^3}\right)^{\frac{3}{2}}}{(ad-bc)^3}-\frac{a^2b^4cd^5\left(-\frac{a^3}{b^3}\right)^{\frac{3}{2}}}{(ad-bc)^3}-\frac{ab^5c^2d^4\left(-\frac{a^3}{b^3}\right)^{\frac{3}{2}}}{(ad-bc)^3}+\frac{b^6c^3d^3\left(-\frac{a^3}{b^3}\right)^{\frac{3}{2}}}{(ad-bc)^3}+\frac{b^4c^4\sqrt{-\frac{a^3}{b^3}}}{ad-bc}}{a^3cd^2+a^2bc^2d+ab^2c^3}\right)$$

$$+\frac{}{4(ad-bc)}$$

$$\sqrt{-\frac{c^3}{d^3}}\log\left(x^2+\frac{-\frac{a^4d^4\sqrt{-\frac{c^3}{d^3}}}{ad-bc}-\frac{a^3b^3d^6\left(-\frac{c^3}{d^3}\right)^{\frac{3}{2}}}{(ad-bc)^3}+\frac{a^2b^4cd^5\left(-\frac{c^3}{d^3}\right)^{\frac{3}{2}}}{(ad-bc)^3}+\frac{ab^5c^2d^4\left(-\frac{c^3}{d^3}\right)^{\frac{3}{2}}}{(ad-bc)^3}-\frac{b^6c^3d^3\left(-\frac{c^3}{d^3}\right)^{\frac{3}{2}}}{(ad-bc)^3}-\frac{b^4c^4\sqrt{-\frac{c^3}{d^3}}}{ad-bc}}{a^3cd^2+a^2bc^2d+ab^2c^3}\right)$$

$$-\frac{}{4(ad-bc)}$$

$$\sqrt{-\frac{c^3}{d^3}}\log\left(x^2+\frac{\frac{a^4d^4\sqrt{-\frac{c^3}{d^3}}}{ad-bc}+\frac{a^3b^3d^6\left(-\frac{c^3}{d^3}\right)^{\frac{3}{2}}}{(ad-bc)^3}-\frac{a^2b^4cd^5\left(-\frac{c^3}{d^3}\right)^{\frac{3}{2}}}{(ad-bc)^3}-\frac{ab^5c^2d^4\left(-\frac{c^3}{d^3}\right)^{\frac{3}{2}}}{(ad-bc)^3}+\frac{b^6c^3d^3\left(-\frac{c^3}{d^3}\right)^{\frac{3}{2}}}{(ad-bc)^3}+\frac{b^4c^4\sqrt{-\frac{c^3}{d^3}}}{ad-bc}}{a^3cd^2+a^2bc^2d+ab^2c^3}\right)$$

$$+\frac{}{4(ad-bc)}$$

$$+\frac{x^2}{2bd}$$

15.9 Problem number 777

$$\int \frac{1}{x^3\left(a+bx^4\right)\left(c+dx^4\right)}\,dx$$

Optimal antiderivative

$$-\frac{1}{2acx^2}-\frac{b^{\frac{3}{2}}\arctan\left(\frac{x^2\sqrt{b}}{\sqrt{a}}\right)}{2a^{\frac{3}{2}}(-ad+bc)}+\frac{d^{\frac{3}{2}}\arctan\left(\frac{x^2\sqrt{d}}{\sqrt{c}}\right)}{2c^{\frac{3}{2}}(-ad+bc)}$$

command

```
integrate(1/x**3/(b*x**4+a)/(d*x**4+c),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

output too large to display

15.10 Problem number 1013

$$\int \frac{\sqrt{x}}{\sqrt{-1+\sqrt{x}}\,\sqrt{1+\sqrt{x}}}\,dx$$

Optimal antiderivative

$$\operatorname{arccosh}\left(\sqrt{x}\right)+\sqrt{x}\,\sqrt{-1+\sqrt{x}}\,\sqrt{1+\sqrt{x}}$$

command

```
integrate(x**(1/2)/(-1+x**(1/2))**(1/2)/(1+x**(1/2))**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{G_{6,6}^{6,2}\left(\begin{matrix}-\frac{3}{4},-\frac{1}{4} & -\frac{1}{2},-\frac{1}{2},0,1\\ -1,-\frac{3}{4},-\frac{1}{2},-\frac{1}{4},0,0 & \end{matrix}\middle|\frac{1}{x}\right)}{2\pi^{\frac{3}{2}}}-\frac{iG_{6,6}^{2,6}\left(\begin{matrix}-\frac{3}{2},-\frac{5}{4},-1,-\frac{3}{4},-\frac{1}{2},1 & \\ -\frac{5}{4},-\frac{3}{4} & -\frac{3}{2},-1,-1,0\end{matrix}\middle|\frac{e^{2i\pi}}{x}\right)}{2\pi^{\frac{3}{2}}}$$

16 Test file number 29

Test folder name:

```
test_cases/1_Algebraic_functions/1.1_Binomial_products/1.1.3_General/29_1.1.3.8_P-x-c_x-^m-a+b_x^n-^p
```

16.1 Problem number 72

$$\int \frac{(a+bx)^4}{c+dx^3}\,dx$$

Optimal antiderivative

$$\frac{4a\,b^3x}{d}+\frac{b^4x^2}{2d}+\frac{\left(b\,c^{\frac{1}{3}}\left(-4a^3d+b^3c\right)-d^{\frac{1}{3}}\left(-a^4d+4a\,b^3c\right)\right)\ln\left(c^{\frac{1}{3}}+d^{\frac{1}{3}}x\right)}{3c^{\frac{2}{3}}d^{\frac{5}{3}}}$$
$$-\frac{\left(b\,c^{\frac{1}{3}}\left(-4a^3d+b^3c\right)-d^{\frac{1}{3}}\left(-a^4d+4a\,b^3c\right)\right)\ln\left(c^{\frac{2}{3}}-c^{\frac{1}{3}}d^{\frac{1}{3}}x+d^{\frac{2}{3}}x^2\right)}{6c^{\frac{2}{3}}d^{\frac{5}{3}}}+\frac{2a^2b^2\ln\left(d\,x^3+c\right)}{d}$$
$$+\frac{\left(b^4c^{\frac{4}{3}}+4a\,b^3c\,d^{\frac{1}{3}}-4a^3b\,c^{\frac{1}{3}}d-a^4d^{\frac{4}{3}}\right)\arctan\left(\frac{\left(c^{\frac{1}{3}}-2d^{\frac{1}{3}}x\right)\sqrt{3}}{3c^{\frac{1}{3}}}\right)\sqrt{3}}{3c^{\frac{2}{3}}d^{\frac{5}{3}}}$$

command

```
integrate((b*x+a)**4/(d*x**3+c),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{4ab^3x}{d}+\frac{b^4x^2}{2d}$$
$$+\text{RootSum}\left(27t^3c^2d^5-162t^2a^2b^2c^2d^4+t\left(36a^7bcd^4+171a^4b^4c^2d^3+36ab^7c^3d^2\right)-a^{12}d^4+4a^9b^3cd^3-6a^6b^6c^2d^2-\right.$$

16.2 Problem number 129

$$\int\frac{c+dx+ex^2}{\left(a-bx^4\right)^3}\,dx$$

Optimal antiderivative

$$\frac{x\left(e\,x^2+dx+c\right)}{8a\left(-b\,x^4+a\right)^2}+\frac{x\left(5e\,x^2+6dx+7c\right)}{32a^2\left(-b\,x^4+a\right)}+\frac{3d\,\text{arctanh}\left(\frac{x^2\sqrt{b}}{\sqrt{a}}\right)}{16a^{\frac{5}{2}}\sqrt{b}}$$
$$+\frac{\arctan\left(\frac{b^{\frac{1}{4}}x}{a^{\frac{1}{4}}}\right)\left(-5e\sqrt{a}+21c\sqrt{b}\right)}{64a^{\frac{11}{4}}b^{\frac{3}{4}}}+\frac{\text{arctanh}\left(\frac{b^{\frac{1}{4}}x}{a^{\frac{1}{4}}}\right)\left(5e\sqrt{a}+21c\sqrt{b}\right)}{64a^{\frac{11}{4}}b^{\frac{3}{4}}}$$

command

```
integrate((e*x**2+d*x+c)/(-b*x**4+a)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\operatorname{RootSum}\left(268435456t^4a^{11}b^3+t^2\left(-6881280a^6b^2ce-4718592a^6b^2d^2\right)+t\left(-153600a^4bde^2-2709504a^3b^2c^2d\right)-\right.$$
$$\left.-\frac{-11acx-10adx^2-9aex^3+7bcx^5+6bdx^6+5bex^7}{32a^4-64a^3bx^4+32a^2b^2x^8}\right.$$

16.3 Problem number 130

$$\int \frac{c+dx+ex^2}{\left(a+bx^4\right)^3}\,dx$$

Optimal antiderivative

$$\frac{x\left(e\,x^2+dx+c\right)}{8a\left(b\,x^4+a\right)^2}+\frac{x\left(5e\,x^2+6dx+7c\right)}{32a^2\left(b\,x^4+a\right)}+\frac{3d\arctan\left(\frac{x^2\sqrt{b}}{\sqrt{a}}\right)}{16a^{\frac{5}{2}}\sqrt{b}}$$
$$-\frac{\ln\left(-a^{\frac{1}{4}}b^{\frac{1}{4}}x\sqrt{2}+\sqrt{a}+x^2\sqrt{b}\right)\left(-5e\sqrt{a}+21c\sqrt{b}\right)\sqrt{2}}{256a^{\frac{11}{4}}b^{\frac{3}{4}}}$$
$$+\frac{\ln\left(a^{\frac{1}{4}}b^{\frac{1}{4}}x\sqrt{2}+\sqrt{a}+x^2\sqrt{b}\right)\left(-5e\sqrt{a}+21c\sqrt{b}\right)\sqrt{2}}{256a^{\frac{11}{4}}b^{\frac{3}{4}}}$$
$$+\frac{\arctan\left(-1+\frac{b^{\frac{1}{4}}x\sqrt{2}}{a^{\frac{1}{4}}}\right)\left(5e\sqrt{a}+21c\sqrt{b}\right)\sqrt{2}}{128a^{\frac{11}{4}}b^{\frac{3}{4}}}$$
$$+\frac{\arctan\left(1+\frac{b^{\frac{1}{4}}x\sqrt{2}}{a^{\frac{1}{4}}}\right)\left(5e\sqrt{a}+21c\sqrt{b}\right)\sqrt{2}}{128a^{\frac{11}{4}}b^{\frac{3}{4}}}$$

command

```
integrate((e*x**2+d*x+c)/(b*x**4+a)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\operatorname{RootSum}\left(268435456t^4a^{11}b^3+t^2\left(6881280a^6b^2ce+4718592a^6b^2d^2\right)+t\left(153600a^4bde^2-2709504a^3b^2c^2d\right)+625a^2\right.$$
$$\left.+\frac{11acx+10adx^2+9aex^3+7bcx^5+6bdx^6+5bex^7}{32a^4+64a^3bx^4+32a^2b^2x^8}\right.$$

16.4 Problem number 131

$$\int \frac{c+dx+ex^2}{(a-bx^4)^4}\,dx$$

Optimal antiderivative

$$\frac{x\left(e\,x^2+dx+c\right)}{12a\left(-b\,x^4+a\right)^3}+\frac{x\left(9e\,x^2+10dx+11c\right)}{96a^2\left(-b\,x^4+a\right)^2}+\frac{x\left(45e\,x^2+60dx+77c\right)}{384a^3\left(-b\,x^4+a\right)}+\frac{5d\arctanh\left(\frac{x^2\sqrt{b}}{\sqrt{a}}\right)}{32a^{\frac{7}{2}}\sqrt{b}}$$
$$+\frac{\arctan\left(\frac{b^{\frac{1}{4}}x}{a^{\frac{1}{4}}}\right)\left(-15e\sqrt{a}+77c\sqrt{b}\right)}{256a^{\frac{15}{4}}b^{\frac{3}{4}}}+\frac{\arctanh\left(\frac{b^{\frac{1}{4}}x}{a^{\frac{1}{4}}}\right)\left(15e\sqrt{a}+77c\sqrt{b}\right)}{256a^{\frac{15}{4}}b^{\frac{3}{4}}}$$

command

```
integrate((e*x**2+d*x+c)/(-b*x**4+a)**4,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\text{RootSum}\left(68719476736t^4a^{15}b^3+t^2\left(-1211105280a^8b^2ce-838860800a^8b^2d^2\right)+t\left(18432000a^5bde^2+485703680a^4\right.\right.$$
$$\left.\left.+\frac{-153a^2cx-132a^2dx^2-113a^2ex^3+198abcx^5+160abdx^6+126abex^7-77b^2cx^9-60b^2dx^{10}-45b^2ex^{11}}{-384a^6+1152a^5bx^4-1152a^4b^2x^8+384a^3b^3x^{12}}\right.\right.$$

16.5 Problem number 132

$$\int \frac{c+dx+ex^2}{(a+bx^4)^4}\,dx$$

Optimal antiderivative

$$\frac{x\left(e\,x^2+dx+c\right)}{12a\left(b\,x^4+a\right)^3}+\frac{x\left(9e\,x^2+10dx+11c\right)}{96a^2\left(b\,x^4+a\right)^2}+\frac{x\left(45e\,x^2+60dx+77c\right)}{384a^3\left(b\,x^4+a\right)}$$
$$+\frac{5d\arctan\left(\frac{x^2\sqrt{b}}{\sqrt{a}}\right)}{32a^{\frac{7}{2}}\sqrt{b}}-\frac{\ln\left(-a^{\frac{1}{4}}b^{\frac{1}{4}}x\sqrt{2}+\sqrt{a}+x^2\sqrt{b}\right)\left(-15e\sqrt{a}+77c\sqrt{b}\right)\sqrt{2}}{1024a^{\frac{15}{4}}b^{\frac{3}{4}}}$$
$$+\frac{\ln\left(a^{\frac{1}{4}}b^{\frac{1}{4}}x\sqrt{2}+\sqrt{a}+x^2\sqrt{b}\right)\left(-15e\sqrt{a}+77c\sqrt{b}\right)\sqrt{2}}{1024a^{\frac{15}{4}}b^{\frac{3}{4}}}$$
$$+\frac{\arctan\left(-1+\frac{b^{\frac{1}{4}}x\sqrt{2}}{a^{\frac{1}{4}}}\right)\left(15e\sqrt{a}+77c\sqrt{b}\right)\sqrt{2}}{512a^{\frac{15}{4}}b^{\frac{3}{4}}}$$
$$+\frac{\arctan\left(1+\frac{b^{\frac{1}{4}}x\sqrt{2}}{a^{\frac{1}{4}}}\right)\left(15e\sqrt{a}+77c\sqrt{b}\right)\sqrt{2}}{512a^{\frac{15}{4}}b^{\frac{3}{4}}}$$

command

```
integrate((e*x**2+d*x+c)/(b*x**4+a)**4,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\text{RootSum}\left(68719476736t^4a^{15}b^3+t^2\left(1211105280a^8b^2ce+838860800a^8b^2d^2\right)+t\left(18432000a^5bde^2-485703680a^4b^2\right.\right.$$
$$\left.\left.+\frac{153a^2cx+132a^2dx^2+113a^2ex^3+198abcx^5+160abdx^6+126abex^7+77b^2cx^9+60b^2dx^{10}+45b^2ex^{11}}{384a^6+1152a^5bx^4+1152a^4b^2x^8+384a^3b^3x^{12}}\right.\right.$$

16.6 Problem number 150

$$\int \frac{c+dx+ex^2+fx^3}{\left(a-bx^4\right)^3}\,dx$$

Optimal antiderivative

$$\frac{x\left(5e\,x^2+6dx+7c\right)}{32a^2\left(-b\,x^4+a\right)}+\frac{af+bx\left(e\,x^2+dx+c\right)}{8ab\left(-b\,x^4+a\right)^2}+\frac{3d\,\text{arctanh}\left(\frac{x^2\sqrt{b}}{\sqrt{a}}\right)}{16a^{\frac{5}{2}}\sqrt{b}}$$
$$+\frac{\arctan\left(\frac{b^{\frac{1}{4}}x}{a^{\frac{1}{4}}}\right)\left(-5e\sqrt{a}+21c\sqrt{b}\right)}{64a^{\frac{11}{4}}b^{\frac{3}{4}}}+\frac{\text{arctanh}\left(\frac{b^{\frac{1}{4}}x}{a^{\frac{1}{4}}}\right)\left(5e\sqrt{a}+21c\sqrt{b}\right)}{64a^{\frac{11}{4}}b^{\frac{3}{4}}}$$

command

```
integrate((f*x**3+e*x**2+d*x+c)/(-b*x**4+a)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\text{RootSum}\left(268435456t^4a^{11}b^3+t^2\left(-6881280a^6b^2ce-4718592a^6b^2d^2\right)+t\left(-153600a^4bde^2-2709504a^3b^2c^2d\right)-\right.$$
$$\left.-\frac{-4a^2f-11abcx-10abdx^2-9abex^3+7b^2cx^5+6b^2dx^6+5b^2ex^7}{32a^4b-64a^3b^2x^4+32a^2b^3x^8}\right.$$

16.7 Problem number 229

$$\int \frac{c + dx^3 + ex^6 + fx^9}{x^7 \left(a + bx^3\right)} \, dx$$

Optimal antiderivative

$$-\frac{c}{6a\,x^6} + \frac{-ad + bc}{3a^2x^3} + \frac{\left(a^2e - abd + b^2c\right)\ln(x)}{a^3} - \frac{\left(-a^3f + a^2be - a\,b^2d + b^3c\right)\ln\left(b\,x^3 + a\right)}{3a^3b}$$

command

```
integrate((f*x**9+e*x**6+d*x**3+c)/x**7/(b*x**3+a),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-ac + x^3(-2ad + 2bc)}{6a^2x^6} + \frac{\left(a^2e - abd + b^2c\right)\log\left(x\right)}{a^3} + \frac{\left(a^3f - a^2be + ab^2d - b^3c\right)\log\left(\frac{a}{b} + x^3\right)}{3a^3b}$$

16.8 Problem number 245

$$\int \frac{c + dx^3 + ex^6 + fx^9}{x^9 \left(a + bx^3\right)} \, dx$$

Optimal antiderivative

$$\begin{aligned}
&-\frac{c}{8a\,x^8} + \frac{-ad + bc}{5a^2x^5} + \frac{-a^2e + abd - b^2c}{2a^3x^2} - \frac{\left(-a^3f + a^2be - a\,b^2d + b^3c\right)\ln\left(a^{\frac{1}{3}} + b^{\frac{1}{3}}x\right)}{3a^{\frac{11}{3}}b^{\frac{1}{3}}} \\
&+ \frac{\left(-a^3f + a^2be - a\,b^2d + b^3c\right)\ln\left(a^{\frac{2}{3}} - a^{\frac{1}{3}}b^{\frac{1}{3}}x + b^{\frac{2}{3}}x^2\right)}{6a^{\frac{11}{3}}b^{\frac{1}{3}}} \\
&+ \frac{\left(-a^3f + a^2be - a\,b^2d + b^3c\right)\arctan\left(\frac{\left(a^{\frac{1}{3}} - 2b^{\frac{1}{3}}x\right)\sqrt{3}}{3a^{\frac{1}{3}}}\right)\sqrt{3}}{3a^{\frac{11}{3}}b^{\frac{1}{3}}}
\end{aligned}$$

command

```
integrate((f*x**9+e*x**6+d*x**3+c)/x**9/(b*x**3+a),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\text{RootSum}\left(27t^3a^{11}b - a^9f^3 + 3a^8bef^2 - 3a^7b^2df^2 - 3a^7b^2e^2f + 3a^6b^3cf^2 + 6a^6b^3def + a^6b^3e^3 - 6a^5b^4cef - 3a^5b^4\right.$$

$$+ \frac{-5a^2c + x^6\left(-20a^2e + 20abd - 20b^2c\right) + x^3\left(-8a^2d + 8abc\right)}{40a^3x^8}$$

16.9 Problem number 255

$$\int \frac{c + dx^3 + ex^6 + fx^9}{x\left(a + bx^3\right)^2}\,dx$$

Optimal antiderivative

$$\frac{f\,x^3}{3b^2} + \frac{-a^3f + a^2be - a\,b^2d + b^3c}{3a\,b^3\left(b\,x^3 + a\right)} + \frac{c\ln(x)}{a^2} - \frac{\left(2a^3f - a^2be + b^3c\right)\ln\left(b\,x^3 + a\right)}{3a^2b^3}$$

command

```
integrate((f*x**9+e*x**6+d*x**3+c)/x/(b*x**3+a)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-a^3f + a^2be - ab^2d + b^3c}{3a^2b^3 + 3ab^4x^3} + \frac{fx^3}{3b^2} + \frac{c\log\left(x\right)}{a^2} - \frac{\left(2a^3f - a^2be + b^3c\right)\log\left(\frac{a}{b} + x^3\right)}{3a^2b^3}$$

16.10 Problem number 261

$$\int \frac{x^7\left(c + dx^3 + ex^6 + fx^9\right)}{\left(a + bx^3\right)^2}\,dx$$

Optimal antiderivative

$$\begin{aligned}
&\frac{\left(-4a^3f + 3a^2be - 2a\,b^2d + b^3c\right)x^2}{2b^5} + \frac{\left(3a^2f - 2abe + b^2d\right)x^5}{5b^4} + \frac{\left(-2af + be\right)x^8}{8b^3} + \frac{f\,x^{11}}{11b^2} \\
&+ \frac{a\left(-a^3f + a^2be - a\,b^2d + b^3c\right)x^2}{3b^5\left(b\,x^3 + a\right)} + \frac{a^{\frac{2}{3}}\left(-14a^3f + 11a^2be - 8a\,b^2d + 5b^3c\right)\ln\left(a^{\frac{1}{3}} + b^{\frac{1}{3}}x\right)}{9b^{\frac{17}{3}}} \\
&- \frac{a^{\frac{2}{3}}\left(-14a^3f + 11a^2be - 8a\,b^2d + 5b^3c\right)\ln\left(a^{\frac{2}{3}} - a^{\frac{1}{3}}b^{\frac{1}{3}}x + b^{\frac{2}{3}}x^2\right)}{18b^{\frac{17}{3}}} \\
&+ \frac{a^{\frac{2}{3}}\left(-14a^3f + 11a^2be - 8a\,b^2d + 5b^3c\right)\arctan\left(\frac{\left(a^{\frac{1}{3}} - 2b^{\frac{1}{3}}x\right)\sqrt{3}}{3a^{\frac{1}{3}}}\right)\sqrt{3}}{9b^{\frac{17}{3}}}
\end{aligned}$$

command

```
integrate(x**7*(f*x**9+e*x**6+d*x**3+c)/(b*x**3+a)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$x^8\left(-\frac{af}{4b^3}+\frac{e}{8b^2}\right)+x^5\left(\frac{3a^2f}{5b^4}-\frac{2ae}{5b^3}+\frac{d}{5b^2}\right)$$
$$+x^2\left(-\frac{2a^3f}{b^5}+\frac{3a^2e}{2b^4}-\frac{ad}{b^3}+\frac{c}{2b^2}\right)+\frac{x^2\left(-a^4f+a^3be-a^2b^2d+ab^3c\right)}{3ab^5+3b^6x^3}$$
$$+\text{RootSum}\left(729t^3b^{17}+2744a^{11}f^3-6468a^{10}bef^2+4704a^9b^2df^2+5082a^9b^2e^2f-2940a^8b^3cf^2-7392a^8b^3def-1\right.$$
$$+\frac{fx^{11}}{11b^2}$$

16.11 Problem number 263

$$\int \frac{x^4\left(c+dx^3+ex^6+fx^9\right)}{\left(a+bx^3\right)^2}\,dx$$

Optimal antiderivative

$$\frac{\left(3a^2f-2abe+b^2d\right)x^2}{2b^4}+\frac{\left(-2af+be\right)x^5}{5b^3}+\frac{f\,x^8}{8b^2}-\frac{\left(-a^3f+a^2be-a\,b^2d+b^3c\right)x^2}{3b^4\left(b\,x^3+a\right)}$$
$$-\frac{\left(-11a^3f+8a^2be-5a\,b^2d+2b^3c\right)\ln\left(a^{\frac{1}{3}}+b^{\frac{1}{3}}x\right)}{9a^{\frac{1}{3}}b^{\frac{14}{3}}}$$
$$+\frac{\left(-11a^3f+8a^2be-5a\,b^2d+2b^3c\right)\ln\left(a^{\frac{2}{3}}-a^{\frac{1}{3}}b^{\frac{1}{3}}x+b^{\frac{2}{3}}x^2\right)}{18a^{\frac{1}{3}}b^{\frac{14}{3}}}$$
$$-\frac{\left(-11a^3f+8a^2be-5a\,b^2d+2b^3c\right)\arctan\left(\frac{\left(a^{\frac{1}{3}}-2b^{\frac{1}{3}}x\right)\sqrt{3}}{3a^{\frac{1}{3}}}\right)\sqrt{3}}{9a^{\frac{1}{3}}b^{\frac{14}{3}}}$$

command

```
integrate(x**4*(f*x**9+e*x**6+d*x**3+c)/(b*x**3+a)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$x^5\left(-\frac{2af}{5b^3}+\frac{e}{5b^2}\right)+x^2\left(\frac{3a^2f}{2b^4}-\frac{ae}{b^3}+\frac{d}{2b^2}\right)+\frac{x^2\left(a^3f-a^2be+ab^2d-b^3c\right)}{3ab^4+3b^5x^3}$$
$$+\text{RootSum}\left(729t^3ab^{14}-1331a^9f^3+2904a^8bef^2-1815a^7b^2df^2-2112a^7b^2e^2f+726a^6b^3cf^2+2640a^6b^3def+51\right.$$
$$+\frac{fx^8}{8b^2}$$

16.12 Problem number 265

$$\int \frac{x\left(c+dx^3+ex^6+fx^9\right)}{\left(a+bx^3\right)^2}\,dx$$

Optimal antiderivative

$$\begin{aligned}
&\frac{(-2af+be)\,x^2}{2b^3}+\frac{f\,x^5}{5b^2}+\frac{\left(-a^3f+a^2be-a\,b^2d+b^3c\right)x^2}{3a\,b^3\left(b\,x^3+a\right)}\\
&-\frac{\left(8a^3f-5a^2be+2a\,b^2d+b^3c\right)\ln\left(a^{\frac{1}{3}}+b^{\frac{1}{3}}x\right)}{9a^{\frac{4}{3}}b^{\frac{11}{3}}}\\
&+\frac{\left(8a^3f-5a^2be+2a\,b^2d+b^3c\right)\ln\left(a^{\frac{2}{3}}-a^{\frac{1}{3}}b^{\frac{1}{3}}x+b^{\frac{2}{3}}x^2\right)}{18a^{\frac{4}{3}}b^{\frac{11}{3}}}\\
&-\frac{\left(8a^3f-5a^2be+2a\,b^2d+b^3c\right)\arctan\left(\frac{\left(a^{\frac{1}{3}}-2b^{\frac{1}{3}}x\right)\sqrt{3}}{3a^{\frac{1}{3}}}\right)\sqrt{3}}{9a^{\frac{4}{3}}b^{\frac{11}{3}}}
\end{aligned}$$

command

```
integrate(x*(f*x**9+e*x**6+d*x**3+c)/(b*x**3+a)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\begin{aligned}
&x^2\left(-\frac{af}{b^3}+\frac{e}{2b^2}\right)+\frac{x^2\left(-a^3f+a^2be-ab^2d+b^3c\right)}{3a^2b^3+3ab^4x^3}\\
&+\text{RootSum}\left(729t^3a^4b^{11}+512a^9f^3-960a^8bef^2+384a^7b^2df^2+600a^7b^2e^2f+192a^6b^3cf^2-480a^6b^3def-125a^6b^{3}\right.\\
&+\frac{fx^5}{5b^2}
\end{aligned}$$

16.13 Problem number 268

$$\int \frac{c+dx^3+ex^6+fx^9}{x^3\left(a+bx^3\right)^2}\,dx$$

Optimal antiderivative

$$-\frac{c}{2a^2x^2}+\frac{fx}{b^2}-\frac{\left(-a^3f+a^2be-a\,b^2d+b^3c\right)x}{3a^2b^2\left(b\,x^3+a\right)}$$
$$-\frac{\left(4a^3f-a^2be-2a\,b^2d+5b^3c\right)\ln\left(a^{\frac{1}{3}}+b^{\frac{1}{3}}x\right)}{9a^{\frac{8}{3}}b^{\frac{7}{3}}}$$
$$+\frac{\left(4a^3f-a^2be-2a\,b^2d+5b^3c\right)\ln\left(a^{\frac{2}{3}}-a^{\frac{1}{3}}b^{\frac{1}{3}}x+b^{\frac{2}{3}}x^2\right)}{18a^{\frac{8}{3}}b^{\frac{7}{3}}}$$
$$+\frac{\left(4a^3f-a^2be-2a\,b^2d+5b^3c\right)\arctan\left(\frac{\left(a^{\frac{1}{3}}-2b^{\frac{1}{3}}x\right)\sqrt{3}}{3a^{\frac{1}{3}}}\right)\sqrt{3}}{9a^{\frac{8}{3}}b^{\frac{7}{3}}}$$

command

```
integrate((f*x**9+e*x**6+d*x**3+c)/x**3/(b*x**3+a)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-3ab^2c+x^3\left(2a^3f-2a^2be+2ab^2d-5b^3c\right)}{6a^3b^2x^2+6a^2b^3x^5}$$
$$+\text{RootSum}\left(729t^3a^8b^7+64a^9f^3-48a^8bef^2-96a^7b^2df^2+12a^7b^2e^2f+240a^6b^3cf^2+48a^6b^3def-a^6b^3e^3-120a\right.$$
$$+\frac{fx}{b^2}$$

16.14 Problem number 269

$$\int\frac{c+dx^3+ex^6+fx^9}{x^5\left(a+bx^3\right)^2}\,dx$$

Optimal antiderivative

$$-\frac{c}{4a^2x^4}+\frac{-ad+2bc}{a^3x}+\frac{\left(-a^3f+a^2be-a\,b^2d+b^3c\right)x^2}{3a^3b\left(b\,x^3+a\right)}$$
$$-\frac{\left(2a^3f+a^2be-4a\,b^2d+7b^3c\right)\ln\left(a^{\frac{1}{3}}+b^{\frac{1}{3}}x\right)}{9a^{\frac{10}{3}}b^{\frac{5}{3}}}$$
$$+\frac{\left(2a^3f+a^2be-4a\,b^2d+7b^3c\right)\ln\left(a^{\frac{2}{3}}-a^{\frac{1}{3}}b^{\frac{1}{3}}x+b^{\frac{2}{3}}x^2\right)}{18a^{\frac{10}{3}}b^{\frac{5}{3}}}$$
$$-\frac{\left(2a^3f+a^2be-4a\,b^2d+7b^3c\right)\arctan\left(\frac{\left(a^{\frac{1}{3}}-2b^{\frac{1}{3}}x\right)\sqrt{3}}{3a^{\frac{1}{3}}}\right)\sqrt{3}}{9a^{\frac{10}{3}}b^{\frac{5}{3}}}$$

command

```
integrate((f*x**9+e*x**6+d*x**3+c)/x**5/(b*x**3+a)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\text{RootSum}\left(729t^3a^{10}b^5+8a^9f^3+12a^8bef^2-48a^7b^2df^2+6a^7b^2e^2f+84a^6b^3cf^2-48a^6b^3def+a^6b^3e^3+84a^5b^4ce\right.$$
$$+\frac{-3a^2bc+x^6\left(-4a^3f+4a^2be-16ab^2d+28b^3c\right)+x^3\left(-12a^2bd+21ab^2c\right)}{12a^4bx^4+12a^3b^2x^7}$$

16.15 Problem number 403

$$\int \frac{x^4\left(c+dx+ex^2+fx^3+gx^4+hx^5\right)}{a+bx^3}\,dx$$

Optimal antiderivative

$$-\frac{a(-ah+be)\,x}{b^3}+\frac{(-af+bc)\,x^2}{2b^2}+\frac{(-ag+bd)\,x^3}{3b^2}+\frac{(-ah+be)\,x^4}{4b^2}$$
$$+\frac{f\,x^5}{5b}+\frac{g\,x^6}{6b}+\frac{h\,x^7}{7b}+\frac{a^{\frac{2}{3}}\left(b^{\frac{2}{3}}(-af+bc)+a^{\frac{2}{3}}(-ah+be)\right)\ln\left(a^{\frac{1}{3}}+b^{\frac{1}{3}}x\right)}{3b^{\frac{10}{3}}}$$
$$-\frac{a^{\frac{2}{3}}\left(b^{\frac{2}{3}}(-af+bc)+a^{\frac{2}{3}}(-ah+be)\right)\ln\left(a^{\frac{2}{3}}-a^{\frac{1}{3}}b^{\frac{1}{3}}x+b^{\frac{2}{3}}x^2\right)}{6b^{\frac{10}{3}}}-\frac{a(-ag+bd)\ln\left(b\,x^3+a\right)}{3b^3}$$
$$+\frac{a^{\frac{2}{3}}\left(b^{\frac{5}{3}}c-a^{\frac{2}{3}}be-a\,b^{\frac{2}{3}}f+a^{\frac{5}{3}}h\right)\arctan\left(\frac{\left(a^{\frac{1}{3}}-2b^{\frac{1}{3}}x\right)\sqrt{3}}{3a^{\frac{1}{3}}}\right)\sqrt{3}}{3b^{\frac{10}{3}}}$$

command

```
integrate(x**4*(h*x**5+g*x**4+f*x**3+e*x**2+d*x+c)/(b*x**3+a),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$x^4\left(-\frac{ah}{4b^2}+\frac{e}{4b}\right)+x^3\left(-\frac{ag}{3b^2}+\frac{d}{3b}\right)+x^2\left(-\frac{af}{2b^2}+\frac{c}{2b}\right)+x\left(\frac{a^2h}{b^3}-\frac{ae}{b^2}\right)$$
$$+\text{RootSum}\left(27t^3b^{10}+t^2\left(-27a^2b^7g+27ab^8d\right)+t\left(-9a^4b^4fh+9a^4b^4g^2+9a^3b^5ch-18a^3b^5dg+9a^3b^5ef-9a^2b^6c\right.\right.$$
$$+\frac{fx^5}{5b}+\frac{gx^6}{6b}+\frac{hx^7}{7b}$$

16.16 Problem number 404

$$\int \frac{x^3\left(c+dx+ex^2+fx^3+gx^4+hx^5\right)}{a+bx^3}\,dx$$

Optimal antiderivative

$$\begin{aligned}
&\frac{(-af+bc)\,x}{b^2}+\frac{(-ag+bd)\,x^2}{2b^2}+\frac{(-ah+be)\,x^3}{3b^2}+\frac{f\,x^4}{4b}+\frac{g\,x^5}{5b}\\
&+\frac{h\,x^6}{6b}-\frac{a^{\frac{1}{3}}\left(b^{\frac{1}{3}}(-af+bc)-a^{\frac{1}{3}}(-ag+bd)\right)\ln\left(a^{\frac{1}{3}}+b^{\frac{1}{3}}x\right)}{3b^{\frac{8}{3}}}\\
&+\frac{a^{\frac{1}{3}}\left(b^{\frac{1}{3}}(-af+bc)-a^{\frac{1}{3}}(-ag+bd)\right)\ln\left(a^{\frac{2}{3}}-a^{\frac{1}{3}}b^{\frac{1}{3}}x+b^{\frac{2}{3}}x^2\right)}{6b^{\frac{8}{3}}}-\frac{a(-ah+be)\ln\left(b\,x^3+a\right)}{3b^3}\\
&+\frac{a^{\frac{1}{3}}\left(b^{\frac{4}{3}}c+a^{\frac{1}{3}}bd-a\,b^{\frac{1}{3}}f-a^{\frac{4}{3}}g\right)\arctan\left(\frac{\left(a^{\frac{1}{3}}-2b^{\frac{1}{3}}x\right)\sqrt{3}}{3a^{\frac{1}{3}}}\right)\sqrt{3}}{3b^{\frac{8}{3}}}
\end{aligned}$$

command

```
integrate(x**3*(h*x**5+g*x**4+f*x**3+e*x**2+d*x+c)/(b*x**3+a),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\begin{aligned}
&x^3\left(-\frac{ah}{3b^2}+\frac{e}{3b}\right)+x^2\left(-\frac{ag}{2b^2}+\frac{d}{2b}\right)+x\left(-\frac{af}{b^2}+\frac{c}{b}\right)\\
&+\text{RootSum}\left(27t^3b^9+t^2\left(-27a^2b^6h+27ab^7e\right)+t\left(9a^4b^3h^2-18a^3b^4eh+9a^3b^4fg-9a^2b^5cg-9a^2b^5df+9a^2b^5e^2+\right.\right.\\
&+\frac{fx^4}{4b}+\frac{gx^5}{5b}+\frac{hx^6}{6b}
\end{aligned}$$

16.17 Problem number 405

$$\int \frac{x^2\left(c+dx+ex^2+fx^3+gx^4+hx^5\right)}{a+bx^3}\,dx$$

Optimal antiderivative

$$\frac{(-ag+bd)\,x}{b^2}+\frac{(-ah+be)\,x^2}{2b^2}+\frac{f\,x^3}{3b}+\frac{g\,x^4}{4b}+\frac{h\,x^5}{5b}$$
$$-\frac{a^{\frac{1}{3}}\left(b^{\frac{1}{3}}(-ag+bd)-a^{\frac{1}{3}}(-ah+be)\right)\ln\left(a^{\frac{1}{3}}+b^{\frac{1}{3}}x\right)}{3b^{\frac{8}{3}}}$$
$$+\frac{a^{\frac{1}{3}}\left(b^{\frac{1}{3}}(-ag+bd)-a^{\frac{1}{3}}(-ah+be)\right)\ln\left(a^{\frac{2}{3}}-a^{\frac{1}{3}}b^{\frac{1}{3}}x+b^{\frac{2}{3}}x^2\right)}{6b^{\frac{8}{3}}}+\frac{(-af+bc)\ln\left(b\,x^3+a\right)}{3b^2}$$
$$+\frac{a^{\frac{1}{3}}\left(b^{\frac{4}{3}}d+a^{\frac{1}{3}}be-a\,b^{\frac{1}{3}}g-a^{\frac{4}{3}}h\right)\arctan\left(\frac{\left(a^{\frac{1}{3}}-2b^{\frac{1}{3}}x\right)\sqrt{3}}{3a^{\frac{1}{3}}}\right)\sqrt{3}}{3b^{\frac{8}{3}}}$$

command

```
integrate(x**2*(h*x**5+g*x**4+f*x**3+e*x**2+d*x+c)/(b*x**3+a),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$x^2\left(-\frac{ah}{2b^2}+\frac{e}{2b}\right)+x\left(-\frac{ag}{b^2}+\frac{d}{b}\right)$$
$$+\text{RootSum}\left(27t^3b^8+t^2\left(27ab^6f-27b^7c\right)+t\left(9a^3b^3gh-9a^2b^4dh-9a^2b^4eg+9a^2b^4f^2-18ab^5cf+9ab^5de+9b^6c^2\right.\right.$$
$$+\frac{fx^3}{3b}+\frac{gx^4}{4b}+\frac{hx^5}{5b}$$

16.18 Problem number 406

$$\int\frac{x\left(c+dx+ex^2+fx^3+gx^4+hx^5\right)}{a+bx^3}\,dx$$

Optimal antiderivative

$$\frac{(-ah+be)\,x}{b^2}+\frac{f\,x^2}{2b}+\frac{g\,x^3}{3b}+\frac{h\,x^4}{4b}-\frac{\left(b^{\frac{2}{3}}(-af+bc)+a^{\frac{2}{3}}(-ah+be)\right)\ln\left(a^{\frac{1}{3}}+b^{\frac{1}{3}}x\right)}{3a^{\frac{1}{3}}b^{\frac{7}{3}}}$$
$$+\frac{\left(b^{\frac{2}{3}}(-af+bc)+a^{\frac{2}{3}}(-ah+be)\right)\ln\left(a^{\frac{2}{3}}-a^{\frac{1}{3}}b^{\frac{1}{3}}x+b^{\frac{2}{3}}x^2\right)}{6a^{\frac{1}{3}}b^{\frac{7}{3}}}+\frac{(-ag+bd)\ln\left(b\,x^3+a\right)}{3b^2}$$
$$-\frac{\left(b^{\frac{5}{3}}c-a^{\frac{2}{3}}be-a\,b^{\frac{2}{3}}f+a^{\frac{5}{3}}h\right)\arctan\left(\frac{\left(a^{\frac{1}{3}}-2b^{\frac{1}{3}}x\right)\sqrt{3}}{3a^{\frac{1}{3}}}\right)\sqrt{3}}{3a^{\frac{1}{3}}b^{\frac{7}{3}}}$$

command

```
integrate(x*(h*x**5+g*x**4+f*x**3+e*x**2+d*x+c)/(b*x**3+a),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$x\left(-\frac{ah}{b^2}+\frac{e}{b}\right)$$
$$+\text{RootSum}\left(27t^3ab^7+t^2\left(27a^2b^5g-27ab^6d\right)+t\left(-9a^3b^3fh+9a^3b^3g^2+9a^2b^4ch-18a^2b^4dg+9a^2b^4ef-9ab^5ce-\right.\right.$$
$$+\frac{fx^2}{2b}+\frac{gx^3}{3b}+\frac{hx^4}{4b}$$

16.19 Problem number 407

$$\int \frac{c+dx+ex^2+fx^3+gx^4+hx^5}{a+bx^3}\,dx$$

Optimal antiderivative

$$\frac{fx}{b}+\frac{g\,x^2}{2b}+\frac{h\,x^3}{3b}+\frac{\left(b^{\frac{1}{3}}(-af+bc)-a^{\frac{1}{3}}(-ag+bd)\right)\ln\left(a^{\frac{1}{3}}+b^{\frac{1}{3}}x\right)}{3a^{\frac{2}{3}}b^{\frac{5}{3}}}$$
$$-\frac{\left(b^{\frac{1}{3}}(-af+bc)-a^{\frac{1}{3}}(-ag+bd)\right)\ln\left(a^{\frac{2}{3}}-a^{\frac{1}{3}}b^{\frac{1}{3}}x+b^{\frac{2}{3}}x^2\right)}{6a^{\frac{2}{3}}b^{\frac{5}{3}}}+\frac{(-ah+be)\ln\left(b\,x^3+a\right)}{3b^2}$$
$$-\frac{\left(b^{\frac{4}{3}}c+a^{\frac{1}{3}}bd-a\,b^{\frac{1}{3}}f-a^{\frac{4}{3}}g\right)\arctan\left(\frac{\left(a^{\frac{1}{3}}-2b^{\frac{1}{3}}x\right)\sqrt{3}}{3a^{\frac{1}{3}}}\right)\sqrt{3}}{3a^{\frac{2}{3}}b^{\frac{5}{3}}}$$

command

```
integrate((h*x**5+g*x**4+f*x**3+e*x**2+d*x+c)/(b*x**3+a),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\text{RootSum}\left(27t^3a^2b^6+t^2\left(27a^3b^4h-27a^2b^5e\right)+t\left(9a^4b^2h^2-18a^3b^3eh+9a^3b^3fg-9a^2b^4cg-9a^2b^4df+9a^2b^4e^2+\right.\right.$$
$$+\frac{fx}{b}+\frac{gx^2}{2b}+\frac{hx^3}{3b}$$

16.20 Problem number 491

$$\int \frac{c+dx+ex^2+fx^3}{\left(a+bx^4\right)^3}\,dx$$

Optimal antiderivative

$$\frac{x\left(5e\,x^2+6dx+7c\right)}{32a^2\left(b\,x^4+a\right)}+\frac{-af+bx\left(e\,x^2+dx+c\right)}{8ab\left(b\,x^4+a\right)^2}+\frac{3d\arctan\left(\frac{x^2\sqrt{b}}{\sqrt{a}}\right)}{16a^{\frac{5}{2}}\sqrt{b}}$$
$$-\frac{\ln\left(-a^{\frac{1}{4}}b^{\frac{1}{4}}x\sqrt{2}+\sqrt{a}+x^2\sqrt{b}\right)\left(-5e\sqrt{a}+21c\sqrt{b}\right)\sqrt{2}}{256a^{\frac{11}{4}}b^{\frac{3}{4}}}$$
$$+\frac{\ln\left(a^{\frac{1}{4}}b^{\frac{1}{4}}x\sqrt{2}+\sqrt{a}+x^2\sqrt{b}\right)\left(-5e\sqrt{a}+21c\sqrt{b}\right)\sqrt{2}}{256a^{\frac{11}{4}}b^{\frac{3}{4}}}$$
$$+\frac{\arctan\left(-1+\frac{b^{\frac{1}{4}}x\sqrt{2}}{a^{\frac{1}{4}}}\right)\left(5e\sqrt{a}+21c\sqrt{b}\right)\sqrt{2}}{128a^{\frac{11}{4}}b^{\frac{3}{4}}}$$
$$+\frac{\arctan\left(1+\frac{b^{\frac{1}{4}}x\sqrt{2}}{a^{\frac{1}{4}}}\right)\left(5e\sqrt{a}+21c\sqrt{b}\right)\sqrt{2}}{128a^{\frac{11}{4}}b^{\frac{3}{4}}}$$

command

```
integrate((f*x**3+e*x**2+d*x+c)/(b*x**4+a)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\text{RootSum}\left(268435456t^4a^{11}b^3+t^2\left(6881280a^6b^2ce+4718592a^6b^2d^2\right)+t\left(153600a^4bde^2-2709504a^3b^2c^2d\right)+625a^2\right.$$
$$\left.+\frac{-4a^2f+11abcx+10abdx^2+9abex^3+7b^2cx^5+6b^2dx^6+5b^2ex^7}{32a^4b+64a^3b^2x^4+32a^2b^3x^8}\right.$$

17 Test file number 33

Test folder name:

`test_cases/1_Algebraic_functions/1.2_Trinomial_products/1.2.1_Quadratic/33_1.2.1.2-d+e_x-^m-a+b_x+c_x^2-^p`

17.1 Problem number 255

$$\int \frac{\left(bx+cx^2\right)^3}{(d+ex)^7}\,dx$$

Optimal antiderivative

$$\begin{aligned}
&-\frac{d^3(-be+cd)^3}{6e^7\,(ex+d)^6}+\frac{3d^2(-be+cd)^2\,(-be+2cd)}{5e^7\,(ex+d)^5}\\
&-\frac{3d(-be+cd)\left(b^2e^2-5bcde+5c^2d^2\right)}{4e^7\,(ex+d)^4}+\frac{(-be+2cd)\left(b^2e^2-10bcde+10c^2d^2\right)}{3e^7\,(ex+d)^3}\\
&-\frac{3c\left(b^2e^2-5bcde+5c^2d^2\right)}{2e^7\,(ex+d)^2}+\frac{3c^2(-be+2cd)}{e^7\,(ex+d)}+\frac{c^3\ln(ex+d)}{e^7}
\end{aligned}$$

command

```
integrate((c*x**2+b*x)**3/(e*x+d)**7,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{c^3\log(d+ex)}{e^7}+\frac{-b^3d^3e^3-6b^2cd^4e^2-30bc^2d^5e+147c^3d^6+x^5\left(-180bc^2e^6+360c^3de^5\right)+x^4\left(-90b^2ce^6-450bc^2de^5+1350c^3d^2e^{}\right.}{60d^6e^7+360d^{}}$$

17.2 Problem number 256

$$\int \frac{\left(bx+cx^2\right)^3}{(d+ex)^8}\,dx$$

Optimal antiderivative

$$\begin{aligned}
&-\frac{d^3(-be+cd)^3}{7e^7\,(ex+d)^7}+\frac{d^2(-be+cd)^2\,(-be+2cd)}{2e^7\,(ex+d)^6}\\
&-\frac{3d(-be+cd)\left(b^2e^2-5bcde+5c^2d^2\right)}{5e^7\,(ex+d)^5}+\frac{(-be+2cd)\left(b^2e^2-10bcde+10c^2d^2\right)}{4e^7\,(ex+d)^4}\\
&-\frac{c\left(b^2e^2-5bcde+5c^2d^2\right)}{e^7\,(ex+d)^3}+\frac{3c^2(-be+2cd)}{2e^7\,(ex+d)^2}-\frac{c^3}{e^7\,(ex+d)}
\end{aligned}$$

command

```
integrate((c*x**2+b*x)**3/(e*x+d)**8,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-b^3d^3e^3-4b^2cd^4e^2-10bc^2d^5e-20c^3d^6-140c^3e^6x^6+x^5\left(-210bc^2e^6-420c^3de^5\right)+x^4\left(-140b^2ce^6-350bc^2de^5-\right.}{140d^7e^7+980d^6e^8x+}$$

17.3 Problem number 275

$$\int \frac{(d+ex)^7}{(bx+cx^2)^3}\,dx$$

Optimal antiderivative

$$\begin{aligned}&-\frac{d^7}{2b^3x^2}+\frac{d^6(-7be+3cd)}{b^4x}+\frac{e^6(-3be+7cd)\,x}{c^4}+\frac{e^7x^2}{2c^3}+\frac{(-be+cd)^7}{2b^3c^5\,(cx+b)^2}\\&+\frac{(-be+cd)^6\,(4be+3cd)}{b^4c^5\,(cx+b)}+\frac{3d^5\left(7b^2e^2-7bcde+2c^2d^2\right)\ln(x)}{b^5}\\&-\frac{3(-be+cd)^5\left(2b^2e^2+3bcde+2c^2d^2\right)\ln(cx+b)}{b^5c^5}\end{aligned}$$

command

```
integrate((e*x+d)**7/(c*x**2+b*x)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\begin{aligned}&x\left(-\frac{3be^7}{c^4}+\frac{7de^6}{c^3}\right)\\&+\frac{-b^3c^5d^7+x^3\left(8b^7ce^7-42b^6c^2de^6+84b^5c^3d^2e^5-70b^4c^4d^3e^4+42b^2c^6d^5e^2-42bc^7d^6e+12c^8d^7\right)+x^2\left(7b^8e^7-35\right.}{2b^6c^5x^2+4b^5}\\&+\frac{e^7x^2}{2c^3}+\frac{3d^5\left(7b^2e^2-7bcde+2c^2d^2\right)\log\left(x+\frac{-21b^3c^4d^5e^2+21b^2c^5d^6e-6bc^6d^7+3bc^4d^5\left(7b^2e^2-7bcde+2c^2d^2\right)}{6b^7e^7-21b^6cde^6+21b^5c^2d^2e^5-42b^2c^5d^5e^2+42bc^6d^6e-12c^7d^7}\right)}{b^5}\\&+\frac{3(be-cd)^5\left(2b^2e^2+3bcde+2c^2d^2\right)\log\left(x+\frac{-21b^3c^4d^5e^2+21b^2c^5d^6e-6bc^6d^7+\frac{3b(be-cd)^5\left(2b^2e^2+3bcde+2c^2d^2\right)}{c}}{6b^7e^7-21b^6cde^6+21b^5c^2d^2e^5-42b^2c^5d^5e^2+42bc^6d^6e-12c^7d^7}\right)}{b^5c^5}\end{aligned}$$

17.4 Problem number 486

$$\int \frac{\left(a+cx^2\right)^3}{(d+ex)^9}\,dx$$

Optimal antiderivative

$$-\frac{\left(a\,e^2+c\,d^2\right)^3}{8e^7\,(ex+d)^8}+\frac{6cd\left(a\,e^2+c\,d^2\right)^2}{7e^7\,(ex+d)^7}-\frac{c\left(a\,e^2+c\,d^2\right)\left(a\,e^2+5c\,d^2\right)}{2e^7\,(ex+d)^6}$$
$$+\frac{4c^2d\left(3a\,e^2+5c\,d^2\right)}{5e^7\,(ex+d)^5}-\frac{3c^2\left(a\,e^2+5c\,d^2\right)}{4e^7\,(ex+d)^4}+\frac{2c^3d}{e^7\,(ex+d)^3}-\frac{c^3}{2e^7\,(ex+d)^2}$$

command

```
integrate((c*x**2+a)**3/(e*x+d)**9,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-35a^3e^6-5a^2cd^2e^4-3ac^2d^4e^2-5c^3d^6-280c^3de^5x^5-140c^3e^6x^6+x^4\left(-210ac^2e^6-350c^3d^2e^4\right)+x^3\left(-168ac^2d}{280d^8e^7+2240d^7e^8x+7840d^6e^9x^2+15680d^5e^{10}x^3+19600d^4e^{11}x^4+}$$

17.5 Problem number 487

$$\int \frac{\left(a+cx^2\right)^3}{(d+ex)^{10}}\,dx$$

Optimal antiderivative

$$-\frac{\left(a\,e^2+c\,d^2\right)^3}{9e^7\,(ex+d)^9}+\frac{3cd\left(a\,e^2+c\,d^2\right)^2}{4e^7\,(ex+d)^8}-\frac{3c\left(a\,e^2+c\,d^2\right)\left(a\,e^2+5c\,d^2\right)}{7e^7\,(ex+d)^7}$$
$$+\frac{2c^2d\left(3a\,e^2+5c\,d^2\right)}{3e^7\,(ex+d)^6}-\frac{3c^2\left(a\,e^2+5c\,d^2\right)}{5e^7\,(ex+d)^5}+\frac{3c^3d}{2e^7\,(ex+d)^4}-\frac{c^3}{3e^7\,(ex+d)^3}$$

command

```
integrate((c*x**2+a)**3/(e*x+d)**10,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-140a^3e^6-15a^2cd^2e^4-6ac^2d^4e^2-5c^3d^6-630c^3de^5x^5-420c^3e^6x^6+x^4\left(-756ac^2e^6-630c^3d^2e^4\right)+x^3\left(-504ac\right.}{1260d^9e^7+11340d^8e^8x+45360d^7e^9x^2+105840d^6e^{10}x^3+158760d^5e^{11}x^4+1587}$$

17.6 Problem number 1288

$$\int \frac{(bd+2cdx)^{5/2}}{a+bx+cx^2}\,dx$$

Optimal antiderivative

$$\frac{4d(2cdx+bd)^{\frac{3}{2}}}{3}+2\left(-4ac+b^2\right)^{\frac{3}{4}}d^{\frac{5}{2}}\arctan\left(\frac{\sqrt{d\,(2cx+b)}}{\left(-4ac+b^2\right)^{\frac{1}{4}}\sqrt{d}}\right)$$
$$-2\left(-4ac+b^2\right)^{\frac{3}{4}}d^{\frac{5}{2}}\operatorname{arctanh}\left(\frac{\sqrt{d\,(2cx+b)}}{\left(-4ac+b^2\right)^{\frac{1}{4}}\sqrt{d}}\right)$$

command

```
integrate((2*c*d*x+b*d)**(5/2)/(c*x**2+b*x+a),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$32abcd^4\,\text{RootSum}\left(t^4\left(16384a^3c^3d^6-12288a^2b^2c^2d^6+3072ab^4cd^6-256b^6d^6\right)+1,\left(t\mapsto t\log\left(16tacd^2-4tb^2d^2+\right.\right.\right.$$
$$-32abcd^4\,\text{RootSum}\left(t^4\left(16384a^3c^3d^6-12288a^2b^2c^2d^6+3072ab^4cd^6-256b^6d^6\right)+1,\left(t\mapsto t\log\left(16tacd^2-4tb^2d^2\right.\right.\right.$$
$$-16acd^3\,\text{RootSum}\left(t^4\left(1024acd^2-256b^2d^2\right)+1,\left(t\mapsto t\log\left(256t^3acd^2-64t^3b^2d^2+\sqrt{bd+2cdx}\right)\right)\right)$$
$$-8b^3d^4\,\text{RootSum}\left(t^4\left(16384a^3c^3d^6-12288a^2b^2c^2d^6+3072ab^4cd^6-256b^6d^6\right)+1,\left(t\mapsto t\log\left(16tacd^2-4tb^2d^2+\right.\right.\right.$$
$$+8b^3d^4\,\text{RootSum}\left(t^4\left(16384a^3c^3d^6-12288a^2b^2c^2d^6+3072ab^4cd^6-256b^6d^6\right)+1,\left(t\mapsto t\log\left(16tacd^2-4tb^2d^2+\right.\right.\right.$$
$$+8b^2d^3\,\text{RootSum}\left(t^4\left(1024acd^2-256b^2d^2\right)+1,\left(t\mapsto t\log\left(256t^3acd^2-64t^3b^2d^2+\sqrt{bd+2cdx}\right)\right)\right)$$
$$-8b^2d^3\,\text{RootSum}\left(t^4\left(1024acd^2-256b^2d^2\right)+1,\left(t\mapsto t\log\left(256t^3acd^2-64t^3b^2d^2+\sqrt{bd+2cdx}\right)\right)\right)$$
$$+4b^2d^3\,\text{RootSum}\left(t^4\left(1024acd^2-256b^2d^2\right)+1,\left(t\mapsto t\log\left(256t^3acd^2-64t^3b^2d^2+\sqrt{bd+2cdx}\right)\right)\right)$$
$$+\frac{4d(bd+2cdx)^{\frac{3}{2}}}{3}$$

17.7 Problem number 1478

$$\int \frac{\left(a^2+2abx+b^2x^2\right)^2}{(d+ex)^9}\,dx$$

Optimal antiderivative

$$-\frac{(-ae+bd)^4}{8e^5\,(ex+d)^8}+\frac{4b(-ae+bd)^3}{7e^5\,(ex+d)^7}-\frac{b^2(-ae+bd)^2}{e^5\,(ex+d)^6}+\frac{4b^3(-ae+bd)}{5e^5\,(ex+d)^5}-\frac{b^4}{4e^5\,(ex+d)^4}$$

command

```
integrate((b**2*x**2+2*a*b*x+a**2)**2/(e*x+d)**9,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-35a^4e^4-20a^3bde^3-10a^2b^2d^2e^2-4ab^3d^3e-b^4d^4-70b^4e^4x^4+x^3\left(-224ab^3e^4-56b^4de^3\right)+x^2\left(-280a^2b^2e^4-1\right.}{280d^8e^5+2240d^7e^6x+7840d^6e^7x^2+15680d^5e^8x^3+19600d^4e^9x^4+15680d^3e^{10}x^5}$$

17.8 Problem number 1479

$$\int \frac{\left(a^2+2abx+b^2x^2\right)^2}{(d+ex)^{10}}\,dx$$

Optimal antiderivative

$$-\frac{(-ae+bd)^4}{9e^5\,(ex+d)^9}+\frac{b(-ae+bd)^3}{2e^5\,(ex+d)^8}-\frac{6b^2(-ae+bd)^2}{7e^5\,(ex+d)^7}+\frac{2b^3(-ae+bd)}{3e^5\,(ex+d)^6}-\frac{b^4}{5e^5\,(ex+d)^5}$$

command

```
integrate((b**2*x**2+2*a*b*x+a**2)**2/(e*x+d)**10,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-70a^4e^4-35a^3bde^3-15a^2b^2d^2e^2-5ab^3d^3e-b^4d^4-126b^4e^4x^4+x^3\left(-420ab^3e^4-84b^4de^3\right)+x^2\left(-540a^2b^2e^4-\right.}{630d^9e^5+5670d^8e^6x+22680d^7e^7x^2+52920d^6e^8x^3+79380d^5e^9x^4+79380d^4e^{10}x^5+529}$$

17.9 Problem number 1480

$$\int \frac{\left(a^2+2abx+b^2x^2\right)^2}{(d+ex)^{11}}\,dx$$

Optimal antiderivative

$$-\frac{(-ae+bd)^4}{10e^5\,(ex+d)^{10}}+\frac{4b(-ae+bd)^3}{9e^5\,(ex+d)^9}-\frac{3b^2(-ae+bd)^2}{4e^5\,(ex+d)^8}+\frac{4b^3(-ae+bd)}{7e^5\,(ex+d)^7}-\frac{b^4}{6e^5\,(ex+d)^6}$$

command

```
integrate((b**2*x**2+2*a*b*x+a**2)**2/(e*x+d)**11,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-126a^4e^4-56a^3bde^3-21a^2b^2d^2e^2-6ab^3d^3e-b^4d^4-210b^4e^4x^4+x^3\left(-720ab^3e^4-120b^4de^3\right)+x^2\left(-945a^2b^2e^4\right.}{1260d^{10}e^5+12600d^9e^6x+56700d^8e^7x^2+151200d^7e^8x^3+264600d^6e^9x^4+317520d^5e^{10}x^5+264600d^4}$$

17.10 Problem number 1495

$$\int \frac{\left(a^2+2abx+b^2x^2\right)^3}{(d+ex)^6}\,dx$$

Optimal antiderivative

$$\frac{b^6x}{e^6}-\frac{(-ae+bd)^6}{5e^7\,(ex+d)^5}+\frac{3b(-ae+bd)^5}{2e^7\,(ex+d)^4}-\frac{5b^2(-ae+bd)^4}{e^7\,(ex+d)^3}$$
$$+\frac{10b^3(-ae+bd)^3}{e^7\,(ex+d)^2}-\frac{15b^4(-ae+bd)^2}{e^7\,(ex+d)}-\frac{6b^5(-ae+bd)\ln(ex+d)}{e^7}$$

command

```
integrate((b**2*x**2+2*a*b*x+a**2)**3/(e*x+d)**6,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{b^6x}{e^6}+\frac{6b^5(ae-bd)\log\left(d+ex\right)}{e^7}$$
$$+\frac{-2a^6e^6-3a^5bde^5-5a^4b^2d^2e^4-10a^3b^3d^3e^3-30a^2b^4d^4e^2+137ab^5d^5e-87b^6d^6+x^4\left(-150a^2b^4e^6+300ab^5de^5-\right.}{}$$

17.11 Problem number 1496

$$\int \frac{\left(a^2+2abx+b^2x^2\right)^3}{(d+ex)^7}\,dx$$

Optimal antiderivative

$$-\frac{(-ae+bd)^6}{6e^7\,(ex+d)^6}+\frac{6b(-ae+bd)^5}{5e^7\,(ex+d)^5}-\frac{15b^2(-ae+bd)^4}{4e^7\,(ex+d)^4}+\frac{20b^3(-ae+bd)^3}{3e^7\,(ex+d)^3}$$
$$-\frac{15b^4(-ae+bd)^2}{2e^7\,(ex+d)^2}+\frac{6b^5(-ae+bd)}{e^7\,(ex+d)}+\frac{b^6\ln(ex+d)}{e^7}$$

command

```
integrate((b**2*x**2+2*a*b*x+a**2)**3/(e*x+d)**7,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{b^6\log(d+ex)}{e^7}$$
$$+\frac{-10a^6e^6-12a^5bde^5-15a^4b^2d^2e^4-20a^3b^3d^3e^3-30a^2b^4d^4e^2-60ab^5d^5e+147b^6d^6+x^5\left(-360ab^5e^6+360b^6de^5\right.}{}$$

17.12 Problem number 1526

$$\int \frac{(d+ex)^7}{\left(a^2+2abx+b^2x^2\right)^3}\,dx$$

Optimal antiderivative

$$\frac{e^6(-6ae+7bd)\,x}{b^7}+\frac{e^7x^2}{2b^6}-\frac{(-ae+bd)^7}{5b^8\,(bx+a)^5}-\frac{7e(-ae+bd)^6}{4b^8\,(bx+a)^4}-\frac{7e^2(-ae+bd)^5}{b^8\,(bx+a)^3}$$
$$-\frac{35e^3(-ae+bd)^4}{2b^8\,(bx+a)^2}-\frac{35e^4(-ae+bd)^3}{b^8\,(bx+a)}+\frac{21e^5(-ae+bd)^2\ln(bx+a)}{b^8}$$

command

```
integrate((e*x+d)**7/(b**2*x**2+2*a*b*x+a**2)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$x\left(-\frac{6ae^7}{b^7}+\frac{7de^6}{b^6}\right)$$
$$+\frac{459a^7e^7-1218a^6bde^6+959a^5b^2d^2e^5-140a^4b^3d^3e^4-35a^3b^4d^4e^3-14a^2b^5d^5e^2-7ab^6d^6e-4b^7d^7+x^4\left(700a^3b^4\right.}{}$$
$$+\frac{e^7x^2}{2b^6}+\frac{21e^5(ae-bd)^2\log(a+bx)}{b^8}$$

17.13 Problem number 1527

$$\int \frac{(d+ex)^6}{\left(a^2+2abx+b^2x^2\right)^3}\,dx$$

Optimal antiderivative

$$\frac{e^6x}{b^6}-\frac{(-ae+bd)^6}{5b^7(bx+a)^5}-\frac{3e(-ae+bd)^5}{2b^7(bx+a)^4}-\frac{5e^2(-ae+bd)^4}{b^7(bx+a)^3}$$
$$-\frac{10e^3(-ae+bd)^3}{b^7(bx+a)^2}-\frac{15e^4(-ae+bd)^2}{b^7(bx+a)}+\frac{6e^5(-ae+bd)\ln(bx+a)}{b^7}$$

command

```
integrate((e*x+d)**6/(b**2*x**2+2*a*b*x+a**2)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-87a^6e^6+137a^5bde^5-30a^4b^2d^2e^4-10a^3b^3d^3e^3-5a^2b^4d^4e^2-3ab^5d^5e-2b^6d^6+x^4\left(-150a^2b^4e^6+300ab^5de^5-\right.}{}$$
$$+\frac{e^6x}{b^6}-\frac{6e^5(ae-bd)\log(a+bx)}{b^7}$$

17.14 Problem number 1798

$$\int \frac{\left(ac+(bc+ad)x+bdx^2\right)^3}{(a+bx)^{12}}\,dx$$

Optimal antiderivative

$$-\frac{(-ad+bc)^3}{8b^4\left(bx+a\right)^8}-\frac{3d(-ad+bc)^2}{7b^4\left(bx+a\right)^7}-\frac{d^2(-ad+bc)}{2b^4\left(bx+a\right)^6}-\frac{d^3}{5b^4\left(bx+a\right)^5}$$

command

```
integrate((a*c+(a*d+b*c)*x+b*d*x**2)**3/(b*x+a)**12,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-a^3d^3-5a^2bcd^2-15ab^2c^2d-35b^3c^3-56b^3d^3x^3+x^2\left(-28ab^2d^3-140b^3cd^2\right)+x\left(-8a^2bd^3-40ab^2cd^2-120b^3\right.}{280a^8b^4+2240a^7b^5x+7840a^6b^6x^2+15680a^5b^7x^3+19600a^4b^8x^4+15680a^3b^9x^5+7840a^2b^{10}x^6+2240ab^{11}x^7+2}$$

17.15 Problem number 1863

$$\int \frac{\left(ade+\left(cd^2+ae^2\right)x+cdex^2\right)^3}{(d+ex)^{10}}\,dx$$

Optimal antiderivative

$$\frac{\left(-a\,e^2+c\,d^2\right)^3}{6e^4\left(ex+d\right)^6}-\frac{3cd\left(-a\,e^2+c\,d^2\right)^2}{5e^4\left(ex+d\right)^5}+\frac{3c^2d^2\left(-a\,e^2+c\,d^2\right)}{4e^4\left(ex+d\right)^4}-\frac{c^3d^3}{3e^4\left(ex+d\right)^3}$$

command

```
integrate((a*d*e+(a*e**2+c*d**2)*x+c*d*e*x**2)**3/(e*x+d)**10,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-10a^3e^6-6a^2cd^2e^4-3ac^2d^4e^2-c^3d^6-20c^3d^3e^3x^3+x^2\left(-45ac^2d^2e^4-15c^3d^4e^2\right)+x\left(-36a^2cde^5-18ac^2d^3e^3-\right.}{60d^6e^4+360d^5e^5x+900d^4e^6x^2+1200d^3e^7x^3+900d^2e^8x^4+360de^9x^5+60e^{10}x^6}$$

17.16 Problem number 1864

$$\int \frac{\left(ade+\left(cd^2+ae^2\right)x+cdex^2\right)^3}{(d+ex)^{11}}\,dx$$

Optimal antiderivative

$$\frac{\left(-a\,e^2+c\,d^2\right)^3}{7e^4\,(ex+d)^7}-\frac{cd\left(-a\,e^2+c\,d^2\right)^2}{2e^4\,(ex+d)^6}+\frac{3c^2d^2\left(-a\,e^2+c\,d^2\right)}{5e^4\,(ex+d)^5}-\frac{c^3d^3}{4e^4\,(ex+d)^4}$$

command

```
integrate((a*d*e+(a*e**2+c*d**2)*x+c*d*e*x**2)**3/(e*x+d)**11,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-20a^3e^6-10a^2cd^2e^4-4ac^2d^4e^2-c^3d^6-35c^3d^3e^3x^3+x^2\left(-84ac^2d^2e^4-21c^3d^4e^2\right)+x\left(-70a^2cde^5-28ac^2d^3e^3\right.}{140d^7e^4+980d^6e^5x+2940d^5e^6x^2+4900d^4e^7x^3+4900d^3e^8x^4+2940d^2e^9x^5+980de^{10}x^6+140e^{11}x^7}$$

17.17 Problem number 1896

$$\int \frac{(d+ex)^{10}}{\left(ade+\left(cd^2+ae^2\right)x+cdex^2\right)^4}\,dx$$

Optimal antiderivative

$$\frac{e^4\left(10a^2e^4-24ac\,d^2e^2+15c^2d^4\right)x}{c^6d^6}+\frac{e^5\left(-2a\,e^2+3c\,d^2\right)x^2}{c^5d^5}+\frac{e^6x^3}{3c^4d^4}-\frac{\left(-a\,e^2+c\,d^2\right)^6}{3c^7d^7\,(cdx+ae)^3}$$
$$-\frac{3e\left(-a\,e^2+c\,d^2\right)^5}{c^7d^7\,(cdx+ae)^2}-\frac{15e^2\left(-a\,e^2+c\,d^2\right)^4}{c^7d^7\,(cdx+ae)}+\frac{20e^3\left(-a\,e^2+c\,d^2\right)^3\ln(cdx+ae)}{c^7d^7}$$

command

```
integrate((e*x+d)**10/(a*d*e+(a*e**2+c*d**2)*x+c*d*e*x**2)**4,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$x^2\left(-\frac{2ae^7}{c^5d^5}+\frac{3e^5}{c^4d^3}\right)+x\left(\frac{10a^2e^8}{c^6d^6}-\frac{24ae^6}{c^5d^4}+\frac{15e^4}{c^4d^2}\right)$$
$$+\frac{-37a^6e^{12}+141a^5cd^2e^{10}-195a^4c^2d^4e^8+110a^3c^3d^6e^6-15a^2c^4d^8e^4-3ac^5d^{10}e^2-c^6d^{12}+x^2\left(-45a^4c^2d^2e^{10}+1\right.}{3a^3c^7d^7e^3-}$$
$$+\frac{e^6x^3}{3c^4d^4}-\frac{20e^3\left(ae^2-cd^2\right)^3\log\left(ae+cdx\right)}{c^7d^7}$$

17.18 Problem number 1897

$$\int \frac{(d+ex)^9}{\left(ade+\left(cd^2+ae^2\right)x+cdex^2\right)^4}\,dx$$

Optimal antiderivative

$$\frac{e^4\left(-4a\,e^2+5c\,d^2\right)x}{c^5d^5}+\frac{e^5x^2}{2c^4d^4}-\frac{\left(-a\,e^2+c\,d^2\right)^5}{3c^6d^6\left(cdx+ae\right)^3}-\frac{5e\left(-a\,e^2+c\,d^2\right)^4}{2c^6d^6\left(cdx+ae\right)^2}$$
$$-\frac{10e^2\left(-a\,e^2+c\,d^2\right)^3}{c^6d^6\left(cdx+ae\right)}+\frac{10e^3\left(-a\,e^2+c\,d^2\right)^2\ln(cdx+ae)}{c^6d^6}$$

command

```
integrate((e*x+d)**9/(a*d*e+(a*e**2+c*d**2)*x+c*d*e*x**2)**4,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$x\left(-\frac{4ae^6}{c^5d^5}+\frac{5e^4}{c^4d^3}\right)$$
$$+\frac{47a^5e^{10}-130a^4cd^2e^8+110a^3c^2d^4e^6-20a^2c^3d^6e^4-5ac^4d^8e^2-2c^5d^{10}+x^2\left(60a^3c^2d^2e^8-180a^2c^3d^4e^6+180ac^4\right.}{6a^3c^6d^6e^3+18a^2c^7d^7e^2x+18ac^8d^8ex}$$
$$+\frac{e^5x^2}{2c^4d^4}+\frac{10e^3\left(ae^2-cd^2\right)^2\log\left(ae+cdx\right)}{c^6d^6}$$

17.19 Problem number 2014

$$\int \frac{(d+ex)^{3/2}}{\left(ade+\left(cd^2+ae^2\right)x+cdex^2\right)^2}\,dx$$

Optimal antiderivative

$$\frac{e\,\operatorname{arctanh}\left(\frac{\sqrt{c}\,\sqrt{d}\,\sqrt{ex+d}}{\sqrt{-a\,e^2+c\,d^2}}\right)}{\left(-a\,e^2+c\,d^2\right)^{\frac{3}{2}}\sqrt{c}\,\sqrt{d}}-\frac{\sqrt{ex+d}}{\left(-a\,e^2+c\,d^2\right)\left(cdx+ae\right)}$$

command

```
integrate((e*x+d)**(3/2)/(a*d*e+(a*e**2+c*d**2)*x+c*d*e*x**2)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{e\sqrt{-\frac{1}{cd\left(ae^2-cd^2\right)^3}}\log\left(-a^2e^4\sqrt{-\frac{1}{cd\left(ae^2-cd^2\right)^3}}+2acd^2e^2\sqrt{-\frac{1}{cd\left(ae^2-cd^2\right)^3}}-c^2d^4\sqrt{-\frac{1}{cd\left(ae^2-cd^2\right)^3}}\right.}{2}$$
$$+\frac{e\sqrt{-\frac{1}{cd\left(ae^2-cd^2\right)^3}}\log\left(a^2e^4\sqrt{-\frac{1}{cd\left(ae^2-cd^2\right)^3}}-2acd^2e^2\sqrt{-\frac{1}{cd\left(ae^2-cd^2\right)^3}}+c^2d^4\sqrt{-\frac{1}{cd\left(ae^2-cd^2\right)^3}}+\right.}{2}$$
$$+\frac{2e\sqrt{d+ex}}{2a^2e^4-2acd^2e^2+2acde^3x-2c^2d^3ex}$$

17.20 Problem number 2129

$$\int \frac{\left(a+bx+cx^2\right)^2}{(d+ex)^7}\,dx$$

Optimal antiderivative

$$-\frac{\left(a\,e^2-bde+c\,d^2\right)^2}{6e^5\,(ex+d)^6}+\frac{2(-be+2cd)\left(a\,e^2-bde+c\,d^2\right)}{5e^5\,(ex+d)^5}$$
$$+\frac{-6c^2d^2-b^2e^2+2ce(-ae+3bd)}{4e^5\,(ex+d)^4}+\frac{2c(-be+2cd)}{3e^5\,(ex+d)^3}-\frac{c^2}{2e^5\,(ex+d)^2}$$

command

```
integrate((c*x**2+b*x+a)**2/(e*x+d)**7,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-10a^2e^4-4abde^3-2acd^2e^2-b^2d^2e^2-2bcd^3e-2c^2d^4-30c^2e^4x^4+x^3\left(-40bce^4-40c^2de^3\right)+x^2\left(-30ace^4-15b\right.}{60d^6e^5+360d^5e^6x+900d^4e^7x^2+1200d^3e^8x^3+900d^2e^9}$$

17.21 Problem number 2130

$$\int \frac{\left(a+bx+cx^2\right)^2}{(d+ex)^8}\,dx$$

Optimal antiderivative

$$-\frac{\left(a\,e^2-bde+c\,d^2\right)^2}{7e^5\,(ex+d)^7}+\frac{(-be+2cd)\left(a\,e^2-bde+c\,d^2\right)}{3e^5\,(ex+d)^6}$$
$$+\frac{-6c^2d^2-b^2e^2+2ce(-ae+3bd)}{5e^5\,(ex+d)^5}+\frac{c(-be+2cd)}{2e^5\,(ex+d)^4}-\frac{c^2}{3e^5\,(ex+d)^3}$$

command

```
integrate((c*x**2+b*x+a)**2/(e*x+d)**8,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-30a^2e^4-10abde^3-4acd^2e^2-2b^2d^2e^2-3bcd^3e-2c^2d^4-70c^2e^4x^4+x^3\left(-105bce^4-70c^2de^3\right)+x^2\left(-84ace^4-\right.}{210d^7e^5+1470d^6e^6x+4410d^5e^7x^2+7350d^4e^8x^3+7350d^3e^9x^4+}$$

17.22 Problem number 2140

$$\int \frac{\left(a+bx+cx^2\right)^3}{(d+ex)^5}\,dx$$

Optimal antiderivative

$$-\frac{c^2(-3be+5cd)\,x}{e^6}+\frac{c^3x^2}{2e^5}-\frac{\left(a\,e^2-bde+c\,d^2\right)^3}{4e^7\,(ex+d)^4}+\frac{(-be+2cd)\left(a\,e^2-bde+c\,d^2\right)^2}{e^7\,(ex+d)^3}$$
$$-\frac{3\left(a\,e^2-bde+c\,d^2\right)\left(5c^2d^2+b^2e^2-ce(-ae+5bd)\right)}{2e^7\,(ex+d)^2}$$
$$+\frac{(-be+2cd)\left(10c^2d^2+b^2e^2-2ce(-3ae+5bd)\right)}{e^7\,(ex+d)}$$
$$+\frac{3c\left(5c^2d^2+b^2e^2-ce(-ae+5bd)\right)\ln(ex+d)}{e^7}$$

command

```
integrate((c*x**2+b*x+a)**3/(e*x+d)**5,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{c^3x^2}{2e^5}+\frac{3c\left(ace^2+b^2e^2-5bcde+5c^2d^2\right)\log\left(d+ex\right)}{e^7}+x\left(\frac{3bc^2}{e^5}-\frac{5c^3d}{e^6}\right)$$
$$+\frac{-a^3e^6-a^2bde^5-a^2cd^2e^4-ab^2d^2e^4-6abcd^3e^3+25ac^2d^4e^2-b^3d^3e^3+25b^2cd^4e^2-77bc^2d^5e+57c^3d^6+x^3\left(-2\right.}{}$$

17.23 Problem number 2154

$$\int \frac{\left(a+bx+cx^2\right)^4}{(d+ex)^4}\,dx$$

Optimal antiderivative

$$\frac{\left(35c^4d^4+b^4e^4-4b^2ce^3(-3ae+4bd)-40c^3d^2e(-ae+2bd)+6c^2e^2\left(a^2e^2-8abde+10b^2d^2\right)\right)x}{e^8}$$
$$-\frac{2c\left(5c^3d^3-b^3e^3-2c^2de(-2ae+5bd)+3bce^2(-ae+2bd)\right)x^2}{e^7}$$
$$+\frac{2c^2\left(5c^2d^2+3b^2e^2-2ce(-ae+4bd)\right)x^3}{3e^6}-\frac{c^3(-be+cd)\,x^4}{e^5}+\frac{c^4x^5}{5e^4}-\frac{\left(a\,e^2-bde+c\,d^2\right)^4}{3e^9\left(ex+d\right)^3}$$
$$+\frac{2(-be+2cd)\left(a\,e^2-bde+c\,d^2\right)^3}{e^9\left(ex+d\right)^2}-\frac{2\left(a\,e^2-bde+c\,d^2\right)^2\left(14c^2d^2+3b^2e^2-2ce(-ae+7bd)\right)}{e^9\left(ex+d\right)}$$
$$-\frac{4(-be+2cd)\left(a\,e^2-bde+c\,d^2\right)\left(7c^2d^2+b^2e^2-ce(-3ae+7bd)\right)\ln(ex+d)}{e^9}$$

command

```
integrate((c*x**2+b*x+a)**4/(e*x+d)**4,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{c^4x^5}{5e^4}+x^4\left(\frac{bc^3}{e^4}-\frac{c^4d}{e^5}\right)+x^3\left(\frac{4ac^3}{3e^4}+\frac{2b^2c^2}{e^4}-\frac{16bc^3d}{3e^5}+\frac{10c^4d^2}{3e^6}\right)$$
$$+x^2\left(\frac{6abc^2}{e^4}-\frac{8ac^3d}{e^5}+\frac{2b^3c}{e^4}-\frac{12b^2c^2d}{e^5}+\frac{20bc^3d^2}{e^6}-\frac{10c^4d^3}{e^7}\right)$$
$$+x\left(\frac{6a^2c^2}{e^4}+\frac{12ab^2c}{e^4}-\frac{48abc^2d}{e^5}+\frac{40ac^3d^2}{e^6}+\frac{b^4}{e^4}-\frac{16b^3cd}{e^5}+\frac{60b^2c^2d^2}{e^6}-\frac{80bc^3d^3}{e^7}+\frac{35c^4d^4}{e^8}\right)$$
$$+\frac{-a^4e^8-2a^3bde^7-4a^3cd^2e^6-6a^2b^2d^2e^6+66a^2bcd^3e^5-78a^2c^2d^4e^4+22ab^3d^3e^5-156ab^2cd^4e^4+282abc^2d^5e^3-}{}$$
$$+\frac{4(be-2cd)\left(ae^2-bde+cd^2\right)\left(3ace^2+b^2e^2-7bcde+7c^2d^2\right)\log\left(d+ex\right)}{e^9}$$

17.24 Problem number 2201

$$\int \frac{(d+ex)^5}{(a+bx+cx^2)^3}\,dx$$

Optimal antiderivative

$$-\frac{e^2(-be+2cd)\left(3c^2d^2-b^2e^2-ce(-7ae+3bd)\right)x}{c^2\left(-4ac+b^2\right)^2}-\frac{(ex+d)^4\left(bd-2ae+(-be+2cd)x\right)}{2\left(-4ac+b^2\right)\left(cx^2+bx+a\right)^2}$$
$$-\frac{(ex+d)^2\left(8ace\left(2ae^2+cd^2\right)-6bcd\left(3ae^2+cd^2\right)+b^2\left(-ae^3+7cd^2e\right)-(-be+2cd)\left(6c^2d^2-b^2e^2-2ce(-5ae\right.}{2c\left(-4ac+b^2\right)^2\left(cx^2+bx+a\right)}$$
$$-\frac{\left(12c^5d^5-b^5e^5+10ab^3ce^5-30a^2bc^2e^5-10c^4d^3e(-4ae+3bd)+20c^3de^2\left(3a^2e^2-3abde+b^2d^2\right)\right)\operatorname{arctanh}\left(\frac{}{\sqrt{}}\right.}{c^3\left(-4ac+b^2\right)^{\frac{5}{2}}}$$
$$+\frac{e^5\ln\left(cx^2+bx+a\right)}{2c^3}$$

command

```
integrate((e*x+d)**5/(c*x**2+b*x+a)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

output too large to display

17.25 Problem number 2214

$$\int \frac{(d+ex)^4}{(a+bx+cx^2)^4}\,dx$$

Optimal antiderivative

$$-\frac{(2cx+b)(ex+d)^4}{3\left(-4ac+b^2\right)\left(cx^2+bx+a\right)^3}+\frac{(ex+d)^3\left(5bcd-2b^2e-2ace+5c(-be+2cd)x\right)}{3\left(-4ac+b^2\right)^2\left(cx^2+bx+a\right)^2}$$
$$-\frac{2\left(5c^2d^2+b^2e^2-ce(-ae+5bd)\right)(ex+d)\left(bd-2ae+(-be+2cd)x\right)}{\left(-4ac+b^2\right)^3\left(cx^2+bx+a\right)}$$
$$+\frac{8\left(ae^2-bde+cd^2\right)\left(5c^2d^2+b^2e^2-ce(-ae+5bd)\right)\operatorname{arctanh}\left(\frac{2cx+b}{\sqrt{-4ac+b^2}}\right)}{\left(-4ac+b^2\right)^{\frac{7}{2}}}$$

command

```
integrate((e*x+d)**4/(c*x**2+b*x+a)**4,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

output too large to display

17.26 Problem number 2291

$$\int \frac{\sqrt{d+ex}}{a+bx+cx^2}\,dx$$

Optimal antiderivative

$$-\frac{\operatorname{arctanh}\left(\frac{\sqrt{2}\,\sqrt{c}\,\sqrt{ex+d}}{\sqrt{2cd-e\left(b-\sqrt{-4ac+b^2}\right)}}\right)\sqrt{2}\,\sqrt{2cd-e\left(b-\sqrt{-4ac+b^2}\right)}}{\sqrt{c}\,\sqrt{-4ac+b^2}}$$
$$+\frac{\operatorname{arctanh}\left(\frac{\sqrt{2}\,\sqrt{c}\,\sqrt{ex+d}}{\sqrt{2cd-e\left(b+\sqrt{-4ac+b^2}\right)}}\right)\sqrt{2}\,\sqrt{2cd-e\left(b+\sqrt{-4ac+b^2}\right)}}{\sqrt{c}\,\sqrt{-4ac+b^2}}$$

command

```
integrate((e*x+d)**(1/2)/(c*x**2+b*x+a),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$2e\,\text{RootSum}\left(t^4\left(256a^2c^3e^4-128ab^2c^2e^4+16b^4ce^4\right)+t^2\left(-16abce^3+32ac^2de^2+4b^3e^3-8b^2cde^2\right)+ae^2-bde+c\right.$$

18 Test file number 34

Test folder name:

`test_cases/1_Algebraic_functions/1.2_Trinomial_products/1.2.1_Quadratic/34_1.2.1.3-d+e_x-^m-f+g_x-a+b_x+c_x^2-^p`

18.1 Problem number 877

$$\int \frac{(A+Bx)\left(a+bx+cx^2\right)^3}{x^8}\,dx$$

Optimal antiderivative

$$-\frac{a^3A}{7x^7}-\frac{a^2(3Ab+aB)}{6x^6}-\frac{3a\big(abB+A\big(ac+b^2\big)\big)}{5x^5}+\frac{-3aB\big(ac+b^2\big)-A\big(6abc+b^3\big)}{4x^4}$$
$$+\frac{-3aA\,c^2-3A\,b^2c-6abBc-b^3B}{3x^3}-\frac{3c\big(Abc+aBc+b^2B\big)}{2x^2}-\frac{c^2(Ac+3bB)}{x}+B\,c^3\ln(x)$$

command

```
integrate((B*x+A)*(c*x**2+b*x+a)**3/x**8,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$Bc^3\log(x)$$
$$+\frac{-60Aa^3+x^6\big(-420Ac^3-1260Bbc^2\big)+x^5\big(-630Abc^2-630Bac^2-630Bb^2c\big)+x^4\big(-420Aac^2-420Ab^2c-840B$$

18.2 Problem number 878

$$\int \frac{(A+Bx)\left(a+bx+cx^2\right)^3}{x^9}\,dx$$

Optimal antiderivative

$$-\frac{a^3A}{8x^8}-\frac{a^2(3Ab+aB)}{7x^7}-\frac{a\big(abB+A\big(ac+b^2\big)\big)}{2x^6}+\frac{-3aB\big(ac+b^2\big)-A\big(6abc+b^3\big)}{5x^5}$$
$$+\frac{-3aA\,c^2-3A\,b^2c-6abBc-b^3B}{4x^4}-\frac{c\big(Abc+aBc+b^2B\big)}{x^3}-\frac{c^2(Ac+3bB)}{2x^2}-\frac{B\,c^3}{x}$$

command

`integrate((B*x+A)*(c*x**2+b*x+a)**3/x**9,x)`

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-35Aa^3 - 280Bc^3x^7 + x^6\left(-140Ac^3 - 420Bbc^2\right) + x^5\left(-280Abc^2 - 280Bac^2 - 280Bb^2c\right) + x^4\left(-210Aac^2 - 210Ab\right.}{}$$

18.3 Problem number 1123

$$\int \frac{(A+Bx)\left(bx+cx^2\right)^2}{(d+ex)^5}\,dx$$

Optimal antiderivative

$$\begin{aligned}
&\frac{B\,c^2x}{e^5} + \frac{d^2(-Ae+Bd)\left(-be+cd\right)^2}{4e^6\left(ex+d\right)^4} - \frac{d(-be+cd)\left(Bd(-3be+5cd)-2Ae(-be+2cd)\right)}{3e^6\left(ex+d\right)^3} \\
&+ \frac{-Ae\left(b^2e^2-6bcde+6c^2d^2\right)+Bd\left(3b^2e^2-12bcde+10c^2d^2\right)}{2e^6\left(ex+d\right)^2} \\
&+ \frac{2Ace(-be+2cd)-B\left(b^2e^2-8bcde+10c^2d^2\right)}{e^6\left(ex+d\right)} - \frac{c(-Ace-2bBe+5Bcd)\ln(ex+d)}{e^6}
\end{aligned}$$

command

`integrate((B*x+A)*(c*x**2+b*x)**2/(e*x+d)**5,x)`

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\begin{aligned}
&\frac{Bc^2x}{e^5} + \frac{c(Ace+2Bbe-5Bcd)\log\left(d+ex\right)}{e^6} \\
&+ \frac{-Ab^2d^2e^3-6Abcd^3e^2+25Ac^2d^4e-3Bb^2d^3e^2+50Bbcd^4e-77Bc^2d^5+x^3\left(-24Abce^5+48Ac^2de^4-12Bb^2e^5+\right.}{}
\end{aligned}$$

18.4 Problem number 1124

$$\int \frac{(A+Bx)\left(bx+cx^2\right)^2}{(d+ex)^6}\,dx$$

Optimal antiderivative

$$\begin{aligned}
&\frac{d^2(-Ae+Bd)\left(-be+cd\right)^2}{5e^6\left(ex+d\right)^5}-\frac{d(-be+cd)\left(Bd(-3be+5cd)-2Ae(-be+2cd)\right)}{4e^6\left(ex+d\right)^4}\\
&+\frac{-Ae\left(b^2e^2-6bcde+6c^2d^2\right)+Bd\left(3b^2e^2-12bcde+10c^2d^2\right)}{3e^6\left(ex+d\right)^3}\\
&+\frac{2Ace(-be+2cd)-B\left(b^2e^2-8bcde+10c^2d^2\right)}{2e^6\left(ex+d\right)^2}+\frac{c(-Ace-2bBe+5Bcd)}{e^6\left(ex+d\right)}+\frac{B\,c^2\ln(ex+d)}{e^6}
\end{aligned}$$

command

```
integrate((B*x+A)*(c*x**2+b*x)**2/(e*x+d)**6,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\begin{aligned}
&\frac{Bc^2\log\left(d+ex\right)}{e^6}\\
&+\frac{-2Ab^2d^2e^3-6Abcd^3e^2-12Ac^2d^4e-3Bb^2d^3e^2-24Bbcd^4e+137Bc^2d^5+x^4\left(-60Ac^2e^5-120Bbce^5+300Bc^2d\right.}
\end{aligned}$$

18.5 Problem number 1155

$$\int \frac{(A+Bx)(d+ex)^4}{\left(bx+cx^2\right)^3}\,dx$$

Optimal antiderivative

$$\begin{aligned}
&-\frac{A\,d^4}{2b^3x^2}-\frac{d^3(4Abe-3Acd+Bbd)}{b^4x}-\frac{(-Ac+bB)\left(-be+cd\right)^4}{2b^3c^3\left(cx+b\right)^2}\\
&-\frac{\left(-be+cd\right)^3\left(-Abce-3A\,c^2d+2b^2Be+2Bbcd\right)}{b^4c^3\left(cx+b\right)}\\
&+\frac{d^2\left(6A\,c^2d^2+2b^2e(3Ae+2Bd)-3bcd(4Ae+Bd)\right)\ln(x)}{b^5}\\
&+\frac{\left(-be+cd\right)^2\left(-6A\,c^3d^2+b^3B\,e^2+2B\,b^2cde+3Bb\,c^2d^2\right)\ln(cx+b)}{b^5c^3}
\end{aligned}$$

command

```
integrate((B*x+A)*(e*x+d)**4/(c*x**2+b*x)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-Ab^3c^3d^4+x^3\left(-2Ab^4c^2e^4+12Ab^2c^4d^2e^2-24Abc^5d^3e+12Ac^6d^4+4Bb^5ce^4-8Bb^4c^2de^3+8Bb^2c^4d^3e-6Bbc^5d\right.}{}$$

$$+\frac{d^2\left(6Ab^2e^2-12Abcde+6Ac^2d^2+4Bb^2de-3Bbcd^2\right)\log\left(x+\frac{-6Ab^3c^2d^2e^2+12Ab^2c^3d^3e-6Abc^4d^4-4Bb^3c^2d^3e+3Bb^2c^3d^4+b}{-12Ab^2c^3d^2e^2+24Abc^4d^3e-12Ac^5d^4+}\right.}{b^5}$$

$$+\frac{(be-cd)^2\left(-6Ac^3d^2+Bb^3e^2+2Bb^2cde+3Bbc^2d^2\right)\log\left(x+\frac{-6Ab^3c^2d^2e^2+12Ab^2c^3d^3e-6Abc^4d^4-4Bb^3c^2d^3e+3Bb^2c^3d^4+}{-12Ab^2c^3d^2e^2+24Abc^4d^3e-12Ac^5d^4+Bb^5}\right.}{b^5c^3}$$

18.6 Problem number 1308

$$\int \frac{(A+Bx)\left(a+cx^2\right)^2}{(d+ex)^6}\,dx$$

Optimal antiderivative

$$\frac{(-Ae+Bd)\left(a\,e^2+c\,d^2\right)^2}{5e^6\,(ex+d)^5}-\frac{\left(a\,e^2+c\,d^2\right)\left(-4Acde+aB\,e^2+5Bc\,d^2\right)}{4e^6\,(ex+d)^4}$$
$$+\frac{2c\left(-aA\,e^3-3Ac\,d^2e+3aBd\,e^2+5Bc\,d^3\right)}{3e^6\,(ex+d)^3}$$
$$-\frac{c\left(-2Acde+aB\,e^2+5Bc\,d^2\right)}{e^6\,(ex+d)^2}+\frac{c^2(-Ae+5Bd)}{e^6\,(ex+d)}+\frac{B\,c^2\ln(ex+d)}{e^6}$$

command

```
integrate((B*x+A)*(c*x**2+a)**2/(e*x+d)**6,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{Bc^2\log\left(d+ex\right)}{e^6}$$

$$+\frac{-12Aa^2e^5-4Aacd^2e^3-12Ac^2d^4e-3Ba^2de^4-6Bacd^3e^2+137Bc^2d^5+x^4\left(-60Ac^2e^5+300Bc^2de^4\right)+x^3\left(-12\right.}{60d^5e^6}$$

18.7 Problem number 1309

$$\int \frac{(A+Bx)\left(a+cx^2\right)^2}{(d+ex)^7}\,dx$$

Optimal antiderivative

$$\begin{aligned}
&\frac{(-Ae+Bd)\left(a\,e^2+c\,d^2\right)^2}{6e^6\,(ex+d)^6}-\frac{\left(a\,e^2+c\,d^2\right)\left(-4Acde+aB\,e^2+5Bc\,d^2\right)}{5e^6\,(ex+d)^5}\\
&+\frac{c\left(-aA\,e^3-3Ac\,d^2e+3aBd\,e^2+5Bc\,d^3\right)}{2e^6\,(ex+d)^4}\\
&-\frac{2c\left(-2Acde+aB\,e^2+5Bc\,d^2\right)}{3e^6\,(ex+d)^3}+\frac{c^2(-Ae+5Bd)}{2e^6\,(ex+d)^2}-\frac{B\,c^2}{e^6\,(ex+d)}
\end{aligned}$$

command

```
integrate((B*x+A)*(c*x**2+a)**2/(e*x+d)**7,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-5Aa^2e^5-Aacd^2e^3-Ac^2d^4e-Ba^2de^4-Bacd^3e^2-5Bc^2d^5-30Bc^2e^5x^5+x^4\left(-15Ac^2e^5-75Bc^2de^4\right)+x^3\left(-2\right.}{30d^6e^6+180d^5e^7x+}$$

18.8 Problem number 1323

$$\int \frac{(A+Bx)\left(a+cx^2\right)^3}{(d+ex)^5}\,dx$$

Optimal antiderivative

$$\begin{aligned}
&-\frac{c^2\left(5Acde-3B\left(a\,e^2+5c\,d^2\right)\right)x}{e^7}-\frac{c^3(-Ae+5Bd)\,x^2}{2e^6}+\frac{B\,c^3x^3}{3e^5}\\
&+\frac{(-Ae+Bd)\left(a\,e^2+c\,d^2\right)^3}{4e^8\,(ex+d)^4}-\frac{\left(a\,e^2+c\,d^2\right)^2\left(-6Acde+aB\,e^2+7Bc\,d^2\right)}{3e^8\,(ex+d)^3}\\
&+\frac{3c\left(a\,e^2+c\,d^2\right)\left(-aA\,e^3-5Ac\,d^2e+3aBd\,e^2+7Bc\,d^3\right)}{2e^8\,(ex+d)^2}\\
&+\frac{c\left(4Acde\left(3a\,e^2+5c\,d^2\right)-B\left(3a^2e^4+30ac\,d^2e^2+35c^2d^4\right)\right)}{e^8\,(ex+d)}\\
&-\frac{c^2\left(-3aA\,e^3-15Ac\,d^2e+15aBd\,e^2+35Bc\,d^3\right)\ln(ex+d)}{e^8}
\end{aligned}$$

command

```
integrate((B*x+A)*(c*x**2+a)**3/(e*x+d)**5,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{Bc^3x^3}{3e^5} - \frac{c^2\left(-3Aae^3 - 15Acd^2e + 15Bade^2 + 35Bcd^3\right)\log\left(d+ex\right)}{e^8}$$
$$+ x^2\left(\frac{Ac^3}{2e^5} - \frac{5Bc^3d}{2e^6}\right) + x\left(-\frac{5Ac^3d}{e^6} + \frac{3Bac^2}{e^5} + \frac{15Bc^3d^2}{e^7}\right)$$
$$+ \frac{-3Aa^3e^7 - 3Aa^2cd^2e^5 + 75Aac^2d^4e^3 + 171Ac^3d^6e - Ba^3de^6 - 9Ba^2cd^3e^4 - 231Bac^2d^5e^2 - 319Bc^3d^7 + x^3\left(144\right.}{}$$

18.9 Problem number 1346

$$\int \frac{(A+Bx)(d+ex)^5}{(a+cx^2)^3}\,dx$$

Optimal antiderivative

$$-\frac{e^2\left(5aBe\left(-3a\,e^2+c\,d^2\right)+Acd\left(7a\,e^2+3c\,d^2\right)\right)x}{8a^2c^3} - \frac{(ex+d)^4\left(a(Ae+Bd)-(Acd-Bae)\,x\right)}{4ac\left(c\,x^2+a\right)^2}$$
$$-\frac{(ex+d)^2\left(2ae\left(2Aa\,e^2+Ac\,d^2+5aBde\right)-\left(5aBe\left(-a\,e^2+c\,d^2\right)+Acd\left(5a\,e^2+3c\,d^2\right)\right)x\right)}{8a^2c^2\left(c\,x^2+a\right)}$$
$$+\frac{\left(5aBe\left(-3a^2e^4+6ac\,d^2e^2+c^2d^4\right)+Acd\left(15a^2e^4+10ac\,d^2e^2+3c^2d^4\right)\right)\arctan\left(\frac{x\sqrt{c}}{\sqrt{a}}\right)}{8a^{\frac{5}{2}}c^{\frac{7}{2}}}$$
$$+\frac{e^4(Ae+5Bd)\ln\left(c\,x^2+a\right)}{2c^3}$$

command

```
integrate((B*x+A)*(e*x+d)**5/(c*x**2+a)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{Be^5x}{c^3}+\left(\frac{e^4(Ae+5Bd)}{2c^3}\right.$$

$$\left.-\frac{\sqrt{-a^5c^7}\left(-15Aa^2cde^4-10Aac^2d^3e^2-3Ac^3d^5+15Ba^3e^5-30Ba^2cd^2e^3-5Bac^2d^4e\right)}{16a^5c^7}\right)\log\left(x+\frac{8Aa^3e^5+40\right.$$

$$+\left(\frac{e^4(Ae+5Bd)}{2c^3}\right.$$

$$\left.+\frac{\sqrt{-a^5c^7}\left(-15Aa^2cde^4-10Aac^2d^3e^2-3Ac^3d^5+15Ba^3e^5-30Ba^2cd^2e^3-5Bac^2d^4e\right)}{16a^5c^7}\right)\log\left(x+\frac{8Aa^3e^5+40.\right.$$

$$+\frac{6Aa^4e^5-20Aa^3cd^2e^3-10Aa^2c^2d^4e+30Ba^4de^4-20Ba^3cd^3e^2-2Ba^2c^2d^5+x^3\left(-25Aa^2c^2de^4+10Aac^3d^3e^2+\right.}{}$$

18.10 Problem number 1347

$$\int\frac{(A+Bx)(d+ex)^4}{\left(a+cx^2\right)^3}\,dx$$

Optimal antiderivative

$$-\frac{(ex+d)^3\left(a(Ae+Bd)-(Acd-Bae)x\right)}{4ac\left(cx^2+a\right)^2}$$
$$-\frac{(ex+d)\left(ae\left(8aBde+3A\left(ae^2+cd^2\right)\right)+\left(4a^2Be^3-cd\left(3Acd^2+ae(3Ae+4Bd)\right)\right)x\right)}{8a^2c^2\left(cx^2+a\right)}$$
$$+\frac{\left(3A\left(ae^2+cd^2\right)^2+4aBde\left(3ae^2+cd^2\right)\right)\arctan\left(\frac{x\sqrt{c}}{\sqrt{a}}\right)}{8a^{\frac{5}{2}}c^{\frac{5}{2}}}+\frac{Be^4\ln\left(cx^2+a\right)}{2c^3}$$

command

```
integrate((B*x+A)*(e*x+d)**4/(c*x**2+a)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\left(\frac{Be^4}{2c^3}\right.$$

$$\left.-\frac{\sqrt{-a^5c^7}\left(3Aa^2e^4+6Aacd^2e^2+3Ac^2d^4+12Ba^2de^3+4Bacd^3e\right)}{16a^5c^6}\right)\log\left(x+\frac{-8Ba^3e^4+16a^3c^3\left(\frac{Be^4}{2c^3}-\frac{\sqrt{-a^5c}}{3Aa^2ce^4+6Aac^2d^2e^2+}\right.\right.$$

$$+\left(\frac{Be^4}{2c^3}\right.$$

$$\left.+\frac{\sqrt{-a^5c^7}\left(3Aa^2e^4+6Aacd^2e^2+3Ac^2d^4+12Ba^2de^3+4Bacd^3e\right)}{16a^5c^6}\right)\log\left(x+\frac{-8Ba^3e^4+16a^3c^3\left(\frac{Be^4}{2c^3}+\frac{\sqrt{-a^5c}}{3Aa^2ce^4+6Aac^2d^2e^2+}\right.\right.$$

$$+\frac{-8Aa^3cde^3-8Aa^2c^2d^3e+6Ba^4e^4-12Ba^3cd^2e^2-2Ba^2c^2d^4+x^3\left(-5Aa^2c^2e^4+6Aac^3d^2e^2+3Ac^4d^4-20Ba^2c\right.}{8a}$$

18.11 Problem number 1513

$$\int \frac{(b+2cx)\left(a+bx+cx^2\right)^2}{(d+ex)^5}\,dx$$

Optimal antiderivative

$$\begin{aligned}&\frac{2c^3x}{e^5}+\frac{(-be+2cd)\left(a\,e^2-bde+c\,d^2\right)^2}{4e^6\left(ex+d\right)^4}\\&-\frac{2\left(a\,e^2-bde+c\,d^2\right)\left(5c^2d^2+b^2e^2-ce(-ae+5bd)\right)}{3e^6\left(ex+d\right)^3}\\&+\frac{(-be+2cd)\left(10c^2d^2+b^2e^2-2ce(-3ae+5bd)\right)}{2e^6\left(ex+d\right)^2}\\&-\frac{4c\left(5c^2d^2+b^2e^2-ce(-ae+5bd)\right)}{e^6\left(ex+d\right)}-\frac{5c^2(-be+2cd)\ln(ex+d)}{e^6}\end{aligned}$$

command

```
integrate((2*c*x+b)*(c*x**2+b*x+a)**2/(e*x+d)**5,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{2c^3x}{e^5}+\frac{5c^2(be-2cd)\log\left(d+ex\right)}{e^6}$$

$$+\frac{-3a^2be^5-2a^2cde^4-2ab^2de^4-6abcd^2e^3-12ac^2d^3e^2-b^3d^2e^3-12b^2cd^3e^2+125bc^2d^4e-154c^3d^5+x^3\left(-48ac^2\right.}$$

18.12 Problem number 1522

$$\int \frac{(b+2cx)\left(a+bx+cx^2\right)^3}{(d+ex)^4}\,dx$$

Optimal antiderivative

$$-\frac{c\left(40c^3d^3-5b^3e^3-2c^2de(-12ae+35bd)+3bc\,e^2(-5ae+12bd)\right)x}{e^7}$$
$$+\frac{c^2\left(6ac\,e^2+9b^2e^2-28bcde+20c^2d^2\right)x^2}{2e^6}-\frac{c^3(-7be+8cd)\,x^3}{3e^5}+\frac{c^4x^4}{2e^4}$$
$$+\frac{(-be+2cd)\left(a\,e^2-bde+c\,d^2\right)^3}{3e^8\,(ex+d)^3}-\frac{\left(a\,e^2-bde+c\,d^2\right)^2\left(14c^2d^2+3b^2e^2-2ce(-ae+7bd)\right)}{2e^8\,(ex+d)^2}$$
$$+\frac{3(-be+2cd)\left(a\,e^2-bde+c\,d^2\right)\left(7c^2d^2+b^2e^2-ce(-3ae+7bd)\right)}{e^8\,(ex+d)}$$
$$+\frac{\left(70c^4d^4+b^4e^4-4b^2c\,e^3(-3ae+5bd)-20c^3d^2e(-3ae+7bd)+6c^2e^2\left(a^2e^2-10abde+15b^2d^2\right)\right)\ln(ex+d)}{e^8}$$

command

```
integrate((2*c*x+b)*(c*x**2+b*x+a)**3/(e*x+d)**4,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{c^4x^4}{2e^4}+x^3\left(\frac{7bc^3}{3e^4}-\frac{8c^4d}{3e^5}\right)+x^2\left(\frac{3ac^3}{e^4}+\frac{9b^2c^2}{2e^4}-\frac{14bc^3d}{e^5}+\frac{10c^4d^2}{e^6}\right)$$
$$+x\left(\frac{15abc^2}{e^4}-\frac{24ac^3d}{e^5}+\frac{5b^3c}{e^4}-\frac{36b^2c^2d}{e^5}+\frac{70bc^3d^2}{e^6}-\frac{40c^4d^3}{e^7}\right)$$
$$+\frac{-2a^3be^7-2a^3cde^6-3a^2b^2de^6-18a^2bcd^2e^5+66a^2c^2d^3e^4-6ab^3d^2e^5+132ab^2cd^3e^4-390abc^2d^4e^3+282ac^3d^5e}{}$$
$$+\frac{\left(6a^2c^2e^4+12ab^2ce^4-60abc^2de^3+60ac^3d^2e^2+b^4e^4-20b^3cde^3+90b^2c^2d^2e^2-140bc^3d^3e+70c^4d^4\right)\log\left(d+ex\right)}{e^8}$$

18.13 Problem number 1524

$$\int \frac{(b+2cx)(d+ex)^4}{a+bx+cx^2}\,dx$$

Optimal antiderivative

$$\frac{e\left(8c^3d^3-b^3e^3+bc\,e^2(3ae+4bd)-2c^2de(4ae+3bd)\right)x}{c^3}$$
$$+\frac{e^2\left(12c^2d^2+b^2e^2-2ce(ae+2bd)\right)x^2}{2c^2}+\frac{e^3(-be+8cd)\,x^3}{3c}+\frac{e^4x^4}{2}$$
$$+\frac{\left(2c^4d^4+b^4e^4-4b^2c\,e^3(ae+bd)-4c^3d^2e(3ae+bd)+2c^2e^2\left(a^2e^2+6abde+3b^2d^2\right)\right)\ln\left(c\,x^2+bx+a\right)}{2c^4}$$
$$-\frac{e(-be+2cd)\left(2c^2d^2+b^2e^2-2ce(ae+bd)\right)\operatorname{arctanh}\left(\frac{2cx+b}{\sqrt{-4ac+b^2}}\right)\sqrt{-4ac+b^2}}{c^4}$$

command

```
integrate((2*c*x+b)*(e*x+d)**4/(c*x**2+b*x+a),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{e^4x^4}{2}+x^3\left(-\frac{be^4}{3c}+\frac{8de^3}{3}\right)+x^2\left(-\frac{ae^4}{c}+\frac{b^2e^4}{2c^2}-\frac{2bde^3}{c}+6d^2e^2\right)$$
$$+x\left(\frac{3abe^4}{c^2}-\frac{8ade^3}{c}-\frac{b^3e^4}{c^3}+\frac{4b^2de^3}{c^2}-\frac{6bd^2e^2}{c}+8d^3e\right)$$
$$+\left(-\frac{e\sqrt{-4ac+b^2}\,(be-2cd)\left(2ace^2-b^2e^2+2bcde-2c^2d^2\right)}{2c^4}\right.$$
$$\left.+\frac{2a^2c^2e^4-4ab^2ce^4+12abc^2de^3-12ac^3d^2e^2+b^4e^4-4b^3cde^3+6b^2c^2d^2e^2-4bc^3d^3e+2c^4d^4}{2c^4}\right)\log\left(x+\frac{a^2ce^4-}{}\right.$$
$$+\left(\frac{e\sqrt{-4ac+b^2}\,(be-2cd)\left(2ace^2-b^2e^2+2bcde-2c^2d^2\right)}{2c^4}\right.$$
$$\left.+\frac{2a^2c^2e^4-4ab^2ce^4+12abc^2de^3-12ac^3d^2e^2+b^4e^4-4b^3cde^3+6b^2c^2d^2e^2-4bc^3d^3e+2c^4d^4}{2c^4}\right)\log\left(x+\frac{a^2ce^4-}{}\right.$$

18.14 Problem number 1540

$$\int \frac{(b+2cx)(d+ex)^4}{(a+bx+cx^2)^3}\,dx$$

Optimal antiderivative

$$\frac{2e^3(-be+2cd)\,x}{c\left(-4ac+b^2\right)}-\frac{(ex+d)^4}{2\left(c\,x^2+bx+a\right)^2}-\frac{2e(ex+d)^2\left(bd-2ae+(-be+2cd)\,x\right)}{\left(-4ac+b^2\right)\left(c\,x^2+bx+a\right)}$$
$$+\frac{2e(-be+2cd)\left(2c^2d^2-b^2e^2-2ce(-3ae+bd)\right)\operatorname{arctanh}\left(\frac{2cx+b}{\sqrt{-4ac+b^2}}\right)}{c^2\left(-4ac+b^2\right)^{\frac{3}{2}}}$$
$$+\frac{e^4\ln\left(c\,x^2+bx+a\right)}{c^2}$$

command

```
integrate((2*c*x+b)*(e*x+d)**4/(c*x**2+b*x+a)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

output too large to display

18.15 Problem number 1672

$$\int \frac{(A+Bx)\left(a^2+2abx+b^2x^2\right)}{(d+ex)^8}\,dx$$

Optimal antiderivative

$$\frac{(-ae+bd)^2(-Ae+Bd)}{7e^4(ex+d)^7}-\frac{(-ae+bd)(-2Abe-Bae+3Bbd)}{6e^4(ex+d)^6}$$
$$+\frac{b(-Abe-2Bae+3Bbd)}{5e^4(ex+d)^5}-\frac{b^2B}{4e^4(ex+d)^4}$$

command

```
integrate((B*x+A)*(b**2*x**2+2*a*b*x+a**2)/(e*x+d)**8,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-60Aa^2e^3-20Aabde^2-4Ab^2d^2e-10Ba^2de^2-8Babd^2e-3Bb^2d^3-105Bb^2e^3x^3+x^2\left(-84Ab^2e^3-168Babe^3-}{420d^7e^4+2940d^6e^5x+8820d^5e^6x^2+14700d^4e^7x^3+14700d^3e^8x^4+88}$$

18.16 Problem number 1685

$$\int \frac{(A+Bx)\left(a^2+2abx+b^2x^2\right)^2}{(d+ex)^5}\,dx$$

Optimal antiderivative

$$\frac{b^4Bx}{e^5}+\frac{(-ae+bd)^4(-Ae+Bd)}{4e^6(ex+d)^4}-\frac{(-ae+bd)^3(-4Abe-Bae+5Bbd)}{3e^6(ex+d)^3}$$
$$+\frac{b(-ae+bd)^2(-3Abe-2Bae+5Bbd)}{e^6(ex+d)^2}-\frac{2b^2(-ae+bd)(-2Abe-3Bae+5Bbd)}{e^6(ex+d)}$$
$$-\frac{b^3(-Abe-4Bae+5Bbd)\ln(ex+d)}{e^6}$$

command

```
integrate((B*x+A)*(b**2*x**2+2*a*b*x+a**2)**2/(e*x+d)**5,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{Bb^4x}{e^5}+\frac{b^3(Abe+4Bae-5Bbd)\log(d+ex)}{e^6}$$
$$+\frac{-3Aa^4e^5-4Aa^3bde^4-6Aa^2b^2d^2e^3-12Aab^3d^3e^2+25Ab^4d^4e-Ba^4de^4-4Ba^3bd^2e^3-18Ba^2b^2d^3e^2+100Bab}$$

19 Test file number 35

Test folder name:

```
test_cases/1_Algebraic_functions/1.2_Trinomial_products/1.2.1_Quadratic/35_1.2.1.4-
d+e_x-^m-f+g_x-^n-a+b_x+c_x^2-^p
```

19.1 Problem number 65

$$\int x^5(d+ex)^3\left(d^2-e^2x^2\right)^{5/2}\,dx$$

Optimal antiderivative

$$\frac{35d^{10}x\left(-e^2x^2+d^2\right)^{\frac{3}{2}}}{3072e^5}+\frac{7d^8x\left(-e^2x^2+d^2\right)^{\frac{5}{2}}}{768e^5}-\frac{124d^5x^2\left(-e^2x^2+d^2\right)^{\frac{7}{2}}}{1287e^4}$$
$$-\frac{7d^4x^3\left(-e^2x^2+d^2\right)^{\frac{7}{2}}}{48e^3}-\frac{31d^3x^4\left(-e^2x^2+d^2\right)^{\frac{7}{2}}}{143e^2}-\frac{7d^2x^5\left(-e^2x^2+d^2\right)^{\frac{7}{2}}}{24e}$$
$$-\frac{3dx^6\left(-e^2x^2+d^2\right)^{\frac{7}{2}}}{13}-\frac{ex^7\left(-e^2x^2+d^2\right)^{\frac{7}{2}}}{14}-\frac{d^6(63063ex+31744d)\left(-e^2x^2+d^2\right)^{\frac{7}{2}}}{1153152e^6}$$
$$+\frac{35d^{14}\arctan\left(\frac{ex}{\sqrt{-e^2x^2+d^2}}\right)}{2048e^6}+\frac{35d^{12}x\sqrt{-e^2x^2+d^2}}{2048e^5}$$

command

```
integrate(x**5*(e*x+d)**3*(-e**2*x**2+d**2)**(5/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

output too large to display

19.2 Problem number 66

$$\int x^4(d+ex)^3\left(d^2-e^2x^2\right)^{5/2}\,dx$$

Optimal antiderivative

$$\frac{9d^9x\left(-e^2x^2+d^2\right)^{\frac{3}{2}}}{512e^4}+\frac{9d^7x\left(-e^2x^2+d^2\right)^{\frac{5}{2}}}{640e^4}-\frac{20d^4x^2\left(-e^2x^2+d^2\right)^{\frac{7}{2}}}{143e^3}$$
$$-\frac{9d^3x^3\left(-e^2x^2+d^2\right)^{\frac{7}{2}}}{40e^2}-\frac{45d^2x^4\left(-e^2x^2+d^2\right)^{\frac{7}{2}}}{143e}-\frac{dx^5\left(-e^2x^2+d^2\right)^{\frac{7}{2}}}{4}$$
$$-\frac{ex^6\left(-e^2x^2+d^2\right)^{\frac{7}{2}}}{13}-\frac{d^5(27027ex+12800d)\left(-e^2x^2+d^2\right)^{\frac{7}{2}}}{320320e^5}$$
$$+\frac{27d^{13}\arctan\left(\frac{ex}{\sqrt{-e^2x^2+d^2}}\right)}{1024e^5}+\frac{27d^{11}x\sqrt{-e^2x^2+d^2}}{1024e^4}$$

command

```
integrate(x**4*(e*x+d)**3*(-e**2*x**2+d**2)**(5/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

output too large to display

19.3 Problem number 67

$$\int x^3(d+ex)^3\left(d^2-e^2x^2\right)^{5/2}\,dx$$

Optimal antiderivative

$$\begin{aligned}&\frac{41d^8x\left(-e^2x^2+d^2\right)^{\frac{3}{2}}}{1536e^3}+\frac{41d^6x\left(-e^2x^2+d^2\right)^{\frac{5}{2}}}{1920e^3}-\frac{23d^3x^2\left(-e^2x^2+d^2\right)^{\frac{7}{2}}}{99e^2}\\&-\frac{41d^2x^3\left(-e^2x^2+d^2\right)^{\frac{7}{2}}}{120e}-\frac{3dx^4\left(-e^2x^2+d^2\right)^{\frac{7}{2}}}{11}\\&-\frac{ex^5\left(-e^2x^2+d^2\right)^{\frac{7}{2}}}{12}-\frac{d^4(28413ex+14720d)\left(-e^2x^2+d^2\right)^{\frac{7}{2}}}{221760e^4}\\&+\frac{41d^{12}\arctan\left(\frac{ex}{\sqrt{-e^2x^2+d^2}}\right)}{1024e^4}+\frac{41d^{10}x\sqrt{-e^2x^2+d^2}}{1024e^3}\end{aligned}$$

command

```
integrate(x**3*(e*x+d)**3*(-e**2*x**2+d**2)**(5/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

output too large to display

19.4 Problem number 267

$$\int\frac{x^4\left(d^2-e^2x^2\right)^p}{d+ex}\,dx$$

Optimal antiderivative

$$\begin{aligned}&\frac{d^4\left(-e^2x^2+d^2\right)^p}{2e^5p}-\frac{d^2\left(-e^2x^2+d^2\right)^{1+p}}{e^5\left(1+p\right)}+\frac{\left(-e^2x^2+d^2\right)^{2+p}}{2e^5\left(2+p\right)}\\&+\frac{x^5\left(-e^2x^2+d^2\right)^p\operatorname{hypergeom}\left(\left[\frac{5}{2},1-p\right],\left[\frac{7}{2}\right],\frac{e^2x^2}{d^2}\right)\left(1-\frac{e^2x^2}{d^2}\right)^{-p}}{5d}\end{aligned}$$

command

```
integrate(x**4*(-e**2*x**2+d**2)**p/(e*x+d),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

output too large to display

19.5 Problem number 529

$$\int \frac{\sqrt{d+ex}}{a+bx+cx^2}\,dx$$

Optimal antiderivative

$$-\frac{\operatorname{arctanh}\left(\frac{\sqrt{2}\,\sqrt{c}\,\sqrt{ex+d}}{\sqrt{2cd-e\left(b-\sqrt{-4ac+b^2}\right)}}\right)\sqrt{2}\,\sqrt{2cd-e\left(b-\sqrt{-4ac+b^2}\right)}}{\sqrt{c}\,\sqrt{-4ac+b^2}}$$
$$+\frac{\operatorname{arctanh}\left(\frac{\sqrt{2}\,\sqrt{c}\,\sqrt{ex+d}}{\sqrt{2cd-e\left(b+\sqrt{-4ac+b^2}\right)}}\right)\sqrt{2}\,\sqrt{2cd-e\left(b+\sqrt{-4ac+b^2}\right)}}{\sqrt{c}\,\sqrt{-4ac+b^2}}$$

command

```
integrate((e*x+d)**(1/2)/(c*x**2+b*x+a),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$2e\,\text{RootSum}\left(t^4\left(256a^2c^3e^4-128ab^2c^2e^4+16b^4ce^4\right)+t^2\left(-16abce^3+32ac^2de^2+4b^3e^3-8b^2cde^2\right)+ae^2-bde+c\right.$$

19.6 Problem number 604

$$\int \frac{-1+2x^2}{\sqrt{-1+x}\,\sqrt{1+x}}\,dx$$

Optimal antiderivative

$$x\sqrt{-1+x}\,\sqrt{1+x}$$

command

```
integrate((2*x**2-1)/(-1+x)**(1/2)/(1+x)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\begin{cases} 2\operatorname{acosh}\left(\frac{\sqrt{2}\,\sqrt{x+1}}{2}\right) & \text{for } \frac{|x+1|}{2} > 1 \\ -2i\operatorname{asin}\left(\frac{\sqrt{2}\,\sqrt{x+1}}{2}\right) & \text{otherwise} \end{cases} + \frac{G_{6,6}^{6,2}\left(\begin{matrix} -\frac{3}{4}, -\frac{1}{4} & -\frac{1}{2}, -\frac{1}{2}, 0, 1 \\ -1, -\frac{3}{4}, -\frac{1}{2}, -\frac{1}{4}, 0, 0 & \end{matrix}\middle| \frac{1}{x^2}\right)}{2\pi^{\frac{3}{2}}}$$
$$- \frac{iG_{6,6}^{2,6}\left(\begin{matrix} -\frac{3}{2}, -\frac{5}{4}, -1, -\frac{3}{4}, -\frac{1}{2}, 1 & \\ & -\frac{5}{4}, -\frac{3}{4} \end{matrix}\middle| \frac{e^{2i\pi}}{x^2}\right)}{2\pi^{\frac{3}{2}}}$$

19.7 Problem number 794

$$\int \frac{a+bx+cx^2}{\sqrt{1-dx}\,\sqrt{1+dx}}\,dx$$

Optimal antiderivative

$$\frac{\left(2a\,d^2+c\right)\arcsin(dx)}{2d^3} - \frac{b\sqrt{-d^2x^2+1}}{d^2} - \frac{cx\sqrt{-d^2x^2+1}}{2d^2}$$

command

```
integrate((c*x**2+b*x+a)/(-d*x+1)**(1/2)/(d*x+1)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{iaG_{6,6}^{6,2}\left(\begin{matrix}\frac{1}{4}, \frac{3}{4} & \frac{1}{2}, \frac{1}{2}, 1, 1\\ 0, \frac{1}{4}, \frac{1}{2}, \frac{3}{4}, 1, 0 & \end{matrix}\middle| \frac{1}{d^2 x^2}\right)}{4\pi^{\frac{3}{2}} d} + \frac{aG_{6,6}^{2,6}\left(\begin{matrix}-\frac{1}{2}, -\frac{1}{4}, 0, \frac{1}{4}, \frac{1}{2}, 1 & \\ -\frac{1}{4}, \frac{1}{4} & -\frac{1}{2}, 0, 0, 0\end{matrix}\middle| \frac{e^{-2i\pi}}{d^2 x^2}\right)}{4\pi^{\frac{3}{2}} d}$$
$$-\frac{ibG_{6,6}^{6,2}\left(\begin{matrix}-\frac{1}{4}, \frac{1}{4} & 0, 0, \frac{1}{2}, 1\\ -\frac{1}{2}, -\frac{1}{4}, 0, \frac{1}{4}, \frac{1}{2}, 0 & \end{matrix}\middle| \frac{1}{d^2 x^2}\right)}{4\pi^{\frac{3}{2}} d^2}$$
$$-\frac{bG_{6,6}^{2,6}\left(\begin{matrix}-1, -\frac{3}{4}, -\frac{1}{2}, -\frac{1}{4}, 0, 1 & \\ -\frac{3}{4}, -\frac{1}{4} & -1, -\frac{1}{2}, -\frac{1}{2}, 0\end{matrix}\middle| \frac{e^{-2i\pi}}{d^2 x^2}\right)}{4\pi^{\frac{3}{2}} d^2}$$
$$-\frac{icG_{6,6}^{6,2}\left(\begin{matrix}-\frac{3}{4}, -\frac{1}{4} & -\frac{1}{2}, -\frac{1}{2}, 0, 1\\ -1, -\frac{3}{4}, -\frac{1}{2}, -\frac{1}{4}, 0, 0 & \end{matrix}\middle| \frac{1}{d^2 x^2}\right)}{4\pi^{\frac{3}{2}} d^3}$$
$$+\frac{cG_{6,6}^{2,6}\left(\begin{matrix}-\frac{3}{2}, -\frac{5}{4}, -1, -\frac{3}{4}, -\frac{1}{2}, 1 & \\ -\frac{5}{4}, -\frac{3}{4} & -\frac{3}{2}, -1, -1, 0\end{matrix}\middle| \frac{e^{-2i\pi}}{d^2 x^2}\right)}{4\pi^{\frac{3}{2}} d^3}$$

20 Test file number 37

Test folder name:

`test_cases/1_Algebraic_functions/1.2_Trinomial_products/1.2.1_Quadratic/37_1.2.1.6-g+h_x-^m-a+b_x+c_x^2-^p-d+e_x+f_x^2-^q`

20.1 Problem number 3

$$\int \frac{(A+Bx)\left(a+bx+cx^2\right)^3}{d+fx^2}\,dx$$

Optimal antiderivative

$$-\frac{\left(b^3Bdf+3Ab^2f(-af+cd)-3bB(-af+cd)^2-Ac\left(3a^2f^2-3acdf+c^2d^2\right)\right)x}{f^3}$$
$$-\frac{\left(Abf\left(-6acf-b^2f+3c^2d\right)-B\left(c^3d^2-3ac^2df+3ab^2f^2-3cf\left(-a^2f+b^2d\right)\right)\right)x^2}{2f^3}$$
$$+\frac{\left(b^3Bf+3Ab^2cf-Ac^2(-3af+cd)-3bBc(-2af+cd)\right)x^3}{3f^2}$$
$$+\frac{c\left(3Abcf-B\left(-3acf-3b^2f+c^2d\right)\right)x^4}{4f^2}+\frac{c^2(Ac+3bB)\,x^5}{5f}+\frac{Bc^3x^6}{6f}$$
$$+\frac{\left(Abf\left(3c^2d^2-6acdf-f\left(-3a^2f+b^2d\right)\right)-B(-af+cd)\left(c^2d^2-2acdf-f\left(-a^2f+3b^2d\right)\right)\right)\ln\left(fx^2+d\right)}{2f^4}$$
$$+\frac{\left(b^3Bd^2f+3Ab^2df(-af+cd)-3bBd(-af+cd)^2-A(-af+cd)^3\right)\arctan\left(\frac{x\sqrt{f}}{\sqrt{d}}\right)}{f^{\frac{7}{2}}\sqrt{d}}$$

command

```
integrate((B*x+A)*(c*x**2+b*x+a)**3/(f*x**2+d),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

output too large to display

21 Test file number 38

Test folder name:

```
test_cases/1_Algebraic_functions/1.2_Trinomial_products/1.2.1_Quadratic/38_1.2.1.9_P-x-d+e_x-^m-a+b_x+c_x^2-^p
```

21.1 Problem number 58

$$\int \frac{(d+ex)^2\left(A+Bx+Cx^2\right)}{\left(a+cx^2\right)^3}\,dx$$

Optimal antiderivative

$$-\frac{(aB-(Ac-aC)\,x)\,(ex+d)^2}{4ac\left(c\,x^2+a\right)^2}-\frac{(ex+d)\left(a(Ac+3aC)\,e-c(3Acd+2Bae+aCd)\,x\right)}{8a^2c^2\left(c\,x^2+a\right)}$$
$$+\frac{\left(a(Ac+3aC)\,e^2+cd(3Acd+2Bae+aCd)\right)\arctan\left(\frac{x\sqrt{c}}{\sqrt{a}}\right)}{8a^{\frac{5}{2}}c^{\frac{5}{2}}}$$

command

```
integrate((e*x+d)**2*(C*x**2+B*x+A)/(c*x**2+a)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{\sqrt{-\frac{1}{a^5c^5}}\left(Aace^2+3Ac^2d^2+2Bacde+3Ca^2e^2+Cacd^2\right)\log\left(-a^3c^2\sqrt{-\frac{1}{a^5c^5}}+x\right)}{16}$$
$$+\frac{\sqrt{-\frac{1}{a^5c^5}}\left(Aace^2+3Ac^2d^2+2Bacde+3Ca^2e^2+Cacd^2\right)\log\left(a^3c^2\sqrt{-\frac{1}{a^5c^5}}+x\right)}{16}$$
$$+\frac{-4Aa^2cde-2Ba^3e^2-2Ba^2cd^2-4Ca^3de+x^3\left(Aac^2e^2+3Ac^3d^2+2Bac^2de-5Ca^2ce^2+Cac^2d^2\right)+x^2\left(-4Ba^2\right.}{8a^4c^2+16a^3c^3x^2+8a^2c^4x^4}$$

21.2 Problem number 67

$$\int \frac{(d+ex)\left(A+Bx+Cx^2\right)}{\left(a+cx^2\right)^4}\,dx$$

Optimal antiderivative

$$-\frac{(aB-(Ac-aC)\,x)\,(ex+d)}{6ac\left(c\,x^2+a\right)^3}+\frac{-2a(2Ac+aC)\,e+c(5Acd+Bae+aCd)\,x}{24a^2c^2\left(c\,x^2+a\right)^2}$$
$$+\frac{(5Acd+Bae+aCd)\,x}{16a^3c\left(c\,x^2+a\right)}+\frac{(5Acd+Bae+aCd)\arctan\left(\frac{x\sqrt{c}}{\sqrt{a}}\right)}{16a^{\frac{7}{2}}c^{\frac{3}{2}}}$$

command

```
integrate((e*x+d)*(C*x**2+B*x+A)/(c*x**2+a)**4,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{\sqrt{-\frac{1}{a^7c^3}}\,(5Acd+Bae+Cad)\log\left(-a^4c\sqrt{-\frac{1}{a^7c^3}}+x\right)}{32}+\frac{\sqrt{-\frac{1}{a^7c^3}}\,(5Acd+Bae+Cad)\log\left(a^4c\sqrt{-\frac{1}{a^7c^3}}+x\right)}{32}+\frac{-8Aa^3ce-8Ba^3cd-4Ca^4e-12Ca^3cex^2+x^5\left(15Ac^4d+3Bac^3e+3Cac^3d\right)+x^3\left(40Aac^3d+8Ba^2c^2e+8Ca^2c\right.}{48a^6c^2+144a^5c^3x^2+144a^4c^4x^4+48a^3c^5x^6}$$

22 Test file number 39

Test folder name:

```
test_cases/1_Algebraic_functions/1.2_Trinomial_products/1.2.2_Quartic/39_1.2.2.2-d_x-
^m-a+b_x^2+c_x^4-^p
```

22.1 Problem number 853

$$\int \frac{1}{x^3\left(a+bx^2+cx^4\right)}\,dx$$

Optimal antiderivative

$$-\frac{1}{2a\,x^2}-\frac{b\ln(x)}{a^2}+\frac{b\ln\left(c\,x^4+b\,x^2+a\right)}{4a^2}-\frac{\left(-2ac+b^2\right)\operatorname{arctanh}\left(\frac{2c\,x^2+b}{\sqrt{-4ac+b^2}}\right)}{2a^2\sqrt{-4ac+b^2}}$$

command

```
integrate(1/x**3/(c*x**4+b*x**2+a),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\left(\frac{b}{4a^2}\right.$$

$$\left.-\frac{\sqrt{-4ac+b^2}\,(2ac-b^2)}{4a^2\,(4ac-b^2)}\right)\log\left(x^2+\frac{-8a^3c\left(\frac{b}{4a^2}-\frac{\sqrt{-4ac+b^2}\,(2ac-b^2)}{4a^2(4ac-b^2)}\right)+2a^2b^2\left(\frac{b}{4a^2}-\frac{\sqrt{-4ac+b^2}\,(2ac-b^2)}{4a^2(4ac-b^2)}\right.}{2ac^2-b^2c}\right.$$

$$+\left(\frac{b}{4a^2}\right.$$

$$\left.+\frac{\sqrt{-4ac+b^2}\,(2ac-b^2)}{4a^2\,(4ac-b^2)}\right)\log\left(x^2+\frac{-8a^3c\left(\frac{b}{4a^2}+\frac{\sqrt{-4ac+b^2}\,(2ac-b^2)}{4a^2(4ac-b^2)}\right)+2a^2b^2\left(\frac{b}{4a^2}+\frac{\sqrt{-4ac+b^2}\,(2ac-b^2)}{4a^2(4ac-b^2)}\right.}{2ac^2-b^2c}\right.$$

$$-\frac{1}{2ax^2}-\frac{b\log(x)}{a^2}$$

22.2 Problem number 861

$$\int \frac{x^7}{\left(a+bx^2+cx^4\right)^2}\,dx$$

Optimal antiderivative

$$-\frac{b\,x^2}{2c\left(-4ac+b^2\right)}+\frac{x^4\left(b\,x^2+2a\right)}{2\left(-4ac+b^2\right)\left(c\,x^4+b\,x^2+a\right)}$$
$$+\frac{b\left(-6ac+b^2\right)\operatorname{arctanh}\left(\frac{2c\,x^2+b}{\sqrt{-4ac+b^2}}\right)}{2c^2\left(-4ac+b^2\right)^{\frac{3}{2}}}+\frac{\ln\left(c\,x^4+b\,x^2+a\right)}{4c^2}$$

command

```
integrate(x**7/(c*x**4+b*x**2+a)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\left(-\frac{b\sqrt{-\left(4ac-b^2\right)^3}\left(6ac-b^2\right)}{4c^2\left(64a^3c^3-48a^2b^2c^2+12ab^4c-b^6\right)}\right.$$

$$\left.+\frac{1}{4c^2}\right)\log\left(x^2+\frac{-32a^2c^3\left(-\frac{b\sqrt{-\left(4ac-b^2\right)^3}\left(6ac-b^2\right)}{4c^2\left(64a^3c^3-48a^2b^2c^2+12ab^4c-b^6\right)}+\frac{1}{4c^2}\right)+8a^2c+16ab^2c^2\left(-\frac{b\sqrt{-\left(4ac-b^2\right)^3}\left(6ac-b^2\right)}{4c^2\left(64a^3c^3-48a^2b^2c^2+12ab^4c-b^6\right)}\right.}{6abc-b^3}\right.$$

$$+\left(\frac{b\sqrt{-\left(4ac-b^2\right)^3}\left(6ac-b^2\right)}{4c^2\left(64a^3c^3-48a^2b^2c^2+12ab^4c-b^6\right)}\right.$$

$$\left.+\frac{1}{4c^2}\right)\log\left(x^2+\frac{-32a^2c^3\left(\frac{b\sqrt{-\left(4ac-b^2\right)^3}\left(6ac-b^2\right)}{4c^2\left(64a^3c^3-48a^2b^2c^2+12ab^4c-b^6\right)}+\frac{1}{4c^2}\right)+8a^2c+16ab^2c^2\left(\frac{b\sqrt{-\left(4ac-b^2\right)^3}\left(6ac-b^2\right)}{4c^2\left(64a^3c^3-48a^2b^2c^2+12ab^4c-b^6\right)}+\right.}{6abc-b^3}\right.$$

$$+\frac{2a^2c-ab^2+x^2\left(3abc-b^3\right)}{8a^2c^3-2ab^2c^2+x^4\left(8ac^4-2b^2c^3\right)+x^2\left(8abc^3-2b^3c^2\right)}$$

22.3 Problem number 868

$$\int\frac{x^6}{\left(a+bx^2+cx^4\right)^2}\,dx$$

Optimal antiderivative

$$-\frac{bx}{2c\left(-4ac+b^2\right)}+\frac{x^3\left(b\,x^2+2a\right)}{2\left(-4ac+b^2\right)\left(c\,x^4+b\,x^2+a\right)}$$

$$+\frac{\arctan\left(\frac{x\sqrt{2}\,\sqrt{c}}{\sqrt{b-\sqrt{-4ac+b^2}}}\right)\left(b^2-6ac-\frac{b\left(-8ac+b^2\right)}{\sqrt{-4ac+b^2}}\right)\sqrt{2}}{4c^{\frac{3}{2}}\left(-4ac+b^2\right)\sqrt{b-\sqrt{-4ac+b^2}}}$$

$$+\frac{\arctan\left(\frac{x\sqrt{2}\,\sqrt{c}}{\sqrt{b+\sqrt{-4ac+b^2}}}\right)\left(b^2-6ac+\frac{b\left(-8ac+b^2\right)}{\sqrt{-4ac+b^2}}\right)\sqrt{2}}{4c^{\frac{3}{2}}\left(-4ac+b^2\right)\sqrt{b+\sqrt{-4ac+b^2}}}$$

command

```
integrate(x**6/(c*x**4+b*x**2+a)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{abx+x^3\left(-2ac+b^2\right)}{8a^2c^2-2ab^2c+x^4\left(8ac^3-2b^2c^2\right)+x^2\left(8abc^2-2b^3c\right)}$$
$$+\text{RootSum}\left(t^4\left(1048576a^6c^9-1572864a^5b^2c^8+983040a^4b^4c^7-327680a^3b^6c^6+61440a^2b^8c^5-6144ab^{10}c^4+256b\right.\right.$$

22.4 Problem number 870

$$\int \frac{x^2}{\left(a+bx^2+cx^4\right)^2}\,dx$$

Optimal antiderivative

$$-\frac{x\left(2cx^2+b\right)}{2\left(-4ac+b^2\right)\left(cx^4+bx^2+a\right)}$$
$$+\frac{\arctan\left(\frac{x\sqrt{2}\,\sqrt{c}}{\sqrt{b-\sqrt{-4ac+b^2}}}\right)\sqrt{c}\,\left(2b-\sqrt{-4ac+b^2}\right)\sqrt{2}}{2\left(-4ac+b^2\right)^{\frac{3}{2}}\sqrt{b-\sqrt{-4ac+b^2}}}$$
$$-\frac{\arctan\left(\frac{x\sqrt{2}\,\sqrt{c}}{\sqrt{b+\sqrt{-4ac+b^2}}}\right)\sqrt{c}\,\left(2b+\sqrt{-4ac+b^2}\right)\sqrt{2}}{2\left(-4ac+b^2\right)^{\frac{3}{2}}\sqrt{b+\sqrt{-4ac+b^2}}}$$

command

```
integrate(x**2/(c*x**4+b*x**2+a)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{bx+2cx^3}{8a^2c-2ab^2+x^4\left(8ac^2-2b^2c\right)+x^2\left(8abc-2b^3\right)}$$
$$+\text{RootSum}\left(t^4\left(1048576a^7c^6-1572864a^6b^2c^5+983040a^5b^4c^4-327680a^4b^6c^3+61440a^3b^8c^2-6144a^2b^{10}c+256a\right.\right.$$

22.5 Problem number 883

$$\int \frac{x^6}{\left(a+bx^2+cx^4\right)^3}\,dx$$

Optimal antiderivative

$$\frac{x^3\left(b\,x^2+2a\right)}{4\left(-4ac+b^2\right)\left(c\,x^4+b\,x^2+a\right)^2}+\frac{3x\left(4ab+\left(4ac+b^2\right)x^2\right)}{8\left(-4ac+b^2\right)^2\left(c\,x^4+b\,x^2+a\right)}$$
$$+\frac{3\arctan\left(\frac{x\sqrt{2}\,\sqrt{c}}{\sqrt{b-\sqrt{-4ac+b^2}}}\right)\left(b^2+4ac-\frac{b\left(12ac+b^2\right)}{\sqrt{-4ac+b^2}}\right)\sqrt{2}}{16\left(-4ac+b^2\right)^2\sqrt{c}\,\sqrt{b-\sqrt{-4ac+b^2}}}$$
$$+\frac{3\arctan\left(\frac{x\sqrt{2}\,\sqrt{c}}{\sqrt{b+\sqrt{-4ac+b^2}}}\right)\left(b^2+4ac+\frac{b\left(12ac+b^2\right)}{\sqrt{-4ac+b^2}}\right)\sqrt{2}}{16\left(-4ac+b^2\right)^2\sqrt{c}\,\sqrt{b+\sqrt{-4ac+b^2}}}$$

command

```
integrate(x**6/(c*x**4+b*x**2+a)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{12a^2bx+x^7\left(12ac^2+3b^2c\right)+x^5\left(16abc+5b^3\right)+x^3\left(-4a^2c+19ab^2\right.}{128a^4c^2-64a^3b^2c+8a^2b^4+x^8\left(128a^2c^4-64ab^2c^3+8b^4c^2\right)+x^6\left(256a^2bc^3-128ab^3c^2+16b^5c\right)+x^4\left(256a^3c^3-4\right.}$$
$$+\text{RootSum}\left(t^4\left(68719476736a^{10}c^{11}-171798691840a^9b^2c^{10}+193273528320a^8b^4c^9-128849018880a^7b^6c^8+56371\right.\right.$$

22.6 Problem number 892

$$\int \frac{1}{x^3\left(a-bx^2+cx^4\right)}\,dx$$

Optimal antiderivative

$$-\frac{1}{2a\,x^2}+\frac{b\ln(x)}{a^2}-\frac{b\ln\left(c\,x^4-b\,x^2+a\right)}{4a^2}+\frac{\left(-2ac+b^2\right)\operatorname{arctanh}\left(\frac{-2c\,x^2+b}{\sqrt{-4ac+b^2}}\right)}{2a^2\sqrt{-4ac+b^2}}$$

command

```
integrate(1/x**3/(c*x**4-b*x**2+a),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\left(-\frac{b}{4a^2}\right.$$

$$\left.-\frac{\sqrt{-4ac+b^2}\,(2ac-b^2)}{4a^2\,(4ac-b^2)}\right)\log\left(x^2+\frac{-8a^3c\left(-\frac{b}{4a^2}-\frac{\sqrt{-4ac+b^2}\,(2ac-b^2)}{4a^2(4ac-b^2)}\right)+2a^2b^2\left(-\frac{b}{4a^2}-\frac{\sqrt{-4ac+b^2}\,(2ac-\right.}{2ac^2-b^2c}\right.$$

$$+\left(-\frac{b}{4a^2}\right.$$

$$\left.+\frac{\sqrt{-4ac+b^2}\,(2ac-b^2)}{4a^2\,(4ac-b^2)}\right)\log\left(x^2+\frac{-8a^3c\left(-\frac{b}{4a^2}+\frac{\sqrt{-4ac+b^2}\,(2ac-b^2)}{4a^2(4ac-b^2)}\right)+2a^2b^2\left(-\frac{b}{4a^2}+\frac{\sqrt{-4ac+b^2}\,(2ac-\right.}{2ac^2-b^2c}\right.$$

$$-\frac{1}{2ax^2}+\frac{b\log(x)}{a^2}$$

23 Test file number 40

Test folder name:

```
test_cases/1_Algebraic_functions/1.2_Trinomial_products/1.2.2_Quartic/40_1.2.2.3-d+e_x^2-
^m-a+b_x^2+c_x^4-^p
```

23.1 Problem number 259

$$\int \frac{\left(a+bx^2+cx^4\right)^2}{\left(d+ex^2\right)^4}\,dx$$

Optimal antiderivative

$$\frac{c^2x}{e^4}+\frac{\left(a\,e^2-bde+c\,d^2\right)^2x}{6d\,e^4\left(e\,x^2+d\right)^3}-\frac{\left(-5a\,e^2-7bde+19c\,d^2\right)\left(a\,e^2-bde+c\,d^2\right)x}{24d^2e^4\left(e\,x^2+d\right)^2}$$
$$+\frac{\left(29c^2d^4-2c\,d^2e(-ae+11bd)+e^2\left(5a^2e^2+2abde+b^2d^2\right)\right)x}{16d^3e^4\left(e\,x^2+d\right)}$$
$$-\frac{\left(35c^2d^4-2c\,d^2e(ae+5bd)-e^2\left(5a^2e^2+2abde+b^2d^2\right)\right)\arctan\left(\frac{x\sqrt{e}}{\sqrt{d}}\right)}{16d^{\frac{7}{2}}e^{\frac{9}{2}}}$$

command

```
integrate((c*x**4+b*x**2+a)**2/(e*x**2+d)**4,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{c^2 x}{e^4} - \frac{\sqrt{-\frac{1}{d^7 e^9}}\left(5a^2e^4+2abde^3+2acd^2e^2+b^2d^2e^2+10bcd^3e-35c^2d^4\right)\log\left(-d^4e^4\sqrt{-\frac{1}{d^7e^9}}+x\right)}{32} + \frac{\sqrt{-\frac{1}{d^7 e^9}}\left(5a^2e^4+2abde^3+2acd^2e^2+b^2d^2e^2+10bcd^3e-35c^2d^4\right)\log\left(d^4e^4\sqrt{-\frac{1}{d^7e^9}}+x\right)}{32} + \frac{x^5\left(15a^2e^6+6abde^5+6acd^2e^4+3b^2d^2e^4-66bcd^3e^3+87c^2d^4e^2\right)+x^3\left(40a^2de^5+16abd^2e^4-16acd^3e^3-8b^2d^3e^3\right.}{48d^6e^4+144d^5e^5x^2+144d^4e^6x^4}$$

23.2 Problem number 266

$$\int \frac{d+ex^2}{a+bx^2+cx^4}\,dx$$

Optimal antiderivative

$$\frac{\arctan\left(\frac{x\sqrt{2}\,\sqrt{c}}{\sqrt{b-\sqrt{-4ac+b^2}}}\right)\left(e+\frac{-be+2cd}{\sqrt{-4ac+b^2}}\right)\sqrt{2}}{2\sqrt{c}\,\sqrt{b-\sqrt{-4ac+b^2}}} + \frac{\arctan\left(\frac{x\sqrt{2}\,\sqrt{c}}{\sqrt{b+\sqrt{-4ac+b^2}}}\right)\left(e+\frac{be-2cd}{\sqrt{-4ac+b^2}}\right)\sqrt{2}}{2\sqrt{c}\,\sqrt{b+\sqrt{-4ac+b^2}}}$$

command

```
integrate((e*x**2+d)/(c*x**4+b*x**2+a),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\text{RootSum}\left(t^4\left(256a^3c^3-128a^2b^2c^2+16ab^4c\right)+t^2\left(-16a^2bce^2+64a^2c^2de+4ab^3e^2-16ab^2cde-16abc^2d^2+4b^3c\right.\right.$$

23.3 Problem number 273

$$\int \frac{1}{\left(a+bx^2+cx^4\right)^2}\,dx$$

Optimal antiderivative

$$\frac{x\left(bc\,x^2-2ac+b^2\right)}{2a\left(-4ac+b^2\right)\left(c\,x^4+b\,x^2+a\right)}$$
$$+\frac{\arctan\left(\frac{x\sqrt{2}\,\sqrt{c}}{\sqrt{b-\sqrt{-4ac+b^2}}}\right)\sqrt{c}\,\left(b^2-12ac+b\sqrt{-4ac+b^2}\right)\sqrt{2}}{4a\left(-4ac+b^2\right)^{\frac{3}{2}}\sqrt{b-\sqrt{-4ac+b^2}}}$$
$$-\frac{\arctan\left(\frac{x\sqrt{2}\,\sqrt{c}}{\sqrt{b+\sqrt{-4ac+b^2}}}\right)\sqrt{c}\,\left(b^2-12ac-b\sqrt{-4ac+b^2}\right)\sqrt{2}}{4a\left(-4ac+b^2\right)^{\frac{3}{2}}\sqrt{b+\sqrt{-4ac+b^2}}}$$

command

```
integrate(1/(c*x**4+b*x**2+a)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-bcx^3+x\left(2ac-b^2\right)}{8a^3c-2a^2b^2+x^4\left(8a^2c^2-2ab^2c\right)+x^2\left(8a^2bc-2ab^3\right)}$$
$$+\text{RootSum}\left(t^4\left(1048576a^9c^6-1572864a^8b^2c^5+983040a^7b^4c^4-327680a^6b^6c^3+61440a^5b^8c^2-6144a^4b^{10}c+256a\right.\right.$$

24 Test file number 41

Test folder name:

```
test_cases/1_Algebraic_functions/1.2_Trinomial_products/1.2.2_Quartic/41_1.2.2.4-f_x-
^m-d+e_x^2-^q-a+b_x^2+c_x^4-^p
```

24.1 Problem number 102

$$\int \frac{x^5\left(A+Bx^2\right)}{a+bx^2+cx^4}\,dx$$

Optimal antiderivative

$$-\frac{(-Ac+bB)\,x^2}{2c^2}+\frac{B\,x^4}{4c}+\frac{\left(-Abc-aBc+b^2B\right)\ln\left(c\,x^4+b\,x^2+a\right)}{4c^3}$$
$$+\frac{\left(2aA\,c^2-A\,b^2c-3abBc+b^3B\right)\operatorname{arctanh}\left(\frac{2c\,x^2+b}{\sqrt{-4ac+b^2}}\right)}{2c^3\sqrt{-4ac+b^2}}$$

command

```
integrate(x**5*(B*x**2+A)/(c*x**4+b*x**2+a),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{Bx^4}{4c}+x^2\left(\frac{A}{2c}-\frac{Bb}{2c^2}\right)+\left(-\frac{\sqrt{-4ac+b^2}\left(-2Aac^2+Ab^2c+3Babc-Bb^3\right)}{4c^3\left(4ac-b^2\right)}\right.$$
$$\left.-\frac{Abc+Bac-Bb^2}{4c^3}\right)\log\left(\right.$$
$$+\left(\frac{\sqrt{-4ac+b^2}\left(-2Aac^2+Ab^2c+3Babc-Bb^3\right)}{4c^3\left(4ac-b^2\right)}\right.$$
$$\left.-\frac{Abc+Bac-Bb^2}{4c^3}\right)\log\left(\right.$$

24.2 Problem number 109

$$\int \frac{A+Bx^2}{a+bx^2+cx^4}\,dx$$

Optimal antiderivative

$$\frac{\arctan\left(\frac{x\sqrt{2}\,\sqrt{c}}{\sqrt{b-\sqrt{-4ac+b^2}}}\right)\left(B+\frac{2Ac-bB}{\sqrt{-4ac+b^2}}\right)\sqrt{2}}{2\sqrt{c}\,\sqrt{b-\sqrt{-4ac+b^2}}}$$
$$+\frac{\arctan\left(\frac{x\sqrt{2}\,\sqrt{c}}{\sqrt{b+\sqrt{-4ac+b^2}}}\right)\left(B+\frac{-2Ac+bB}{\sqrt{-4ac+b^2}}\right)\sqrt{2}}{2\sqrt{c}\,\sqrt{b+\sqrt{-4ac+b^2}}}$$

command

```
integrate((B*x**2+A)/(c*x**4+b*x**2+a),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\text{RootSum}\left(t^4\left(256a^3c^3-128a^2b^2c^2+16ab^4c\right)+t^2\left(-16A^2abc^2+4A^2b^3c+64ABa^2c^2-16ABab^2c-16B^2a^2bc+4\right.\right.$$

24.3 Problem number 126

$$\int \frac{x^7\left(A+Bx^2\right)}{\left(a+bx^2+cx^4\right)^3}\,dx$$

Optimal antiderivative

$$-\frac{x^6\left(Ab-2aB-(-2Ac+bB)\,x^2\right)}{4\left(-4ac+b^2\right)\left(c\,x^4+b\,x^2+a\right)^2}+\frac{3(Ab-2aB)\,x^2\left(b\,x^2+2a\right)}{4\left(-4ac+b^2\right)^2\left(c\,x^4+b\,x^2+a\right)}$$
$$+\frac{3a(Ab-2aB)\,\text{arctanh}\left(\frac{2c\,x^2+b}{\sqrt{-4ac+b^2}}\right)}{\left(-4ac+b^2\right)^{\frac{5}{2}}}$$

command

```
integrate(x**7*(B*x**2+A)/(c*x**4+b*x**2+a)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{3a\sqrt{-\frac{1}{(4ac-b^2)^5}}\,(-Ab+2Ba)\log\left(x^2+\frac{-3Aab^2+6Ba^2b-192a^4c^3\sqrt{-\frac{1}{(4ac-b^2)^5}}\,(-Ab+2Ba)+144a^3b^2c^2\sqrt{-\frac{1}{(4ac-b^2)^5}}}{-}\right.}{2}$$

$$+\frac{3a\sqrt{-\frac{1}{(4ac-b^2)^5}}\,(-Ab+2Ba)\log\left(x^2+\frac{-3Aab^2+6Ba^2b+192a^4c^3\sqrt{-\frac{1}{(4ac-b^2)^5}}\,(-Ab+2Ba)-144a^3b^2c^2\sqrt{-\frac{1}{(4ac-b^2)^5}}}{-}\right.}{2}$$

$$+\frac{-8Aa^3c^2-Aa^2b^2c+10Ba^3bc-Ba^2b^3+x^6\left(-6Aabc^3-20Ba^2c^3+16Bab^2c^2-2Bb^4c\right)+x^4\left(-16Aa^2c^3-Aab^2\right.}{64a^4c^4-32a^3b^2c^3+4a^2b^4c^2+x^8\left(64a^2c^6-32ab^2c^5+4b^4c^4\right)+x^6\left(128a^2bc^5-64ab^3c^4+\right.}$$

24.4 Problem number 127

$$\int \frac{x^5\left(A+Bx^2\right)}{\left(a+bx^2+cx^4\right)^3}\,dx$$

Optimal antiderivative

$$-\frac{x^4\left(Ab-2aB-\left(-2Ac+bB\right)x^2\right)}{4\left(-4ac+b^2\right)\left(c\,x^4+b\,x^2+a\right)^2}$$
$$+\frac{-a\left(-6Abc+8aBc+b^2B\right)-\left(4aA\,c^2-4A\,b^2c+2abBc+b^3B\right)x^2}{4c\left(-4ac+b^2\right)^2\left(c\,x^4+b\,x^2+a\right)}$$
$$+\frac{\left(3abB-A\left(2ac+b^2\right)\right)\operatorname{arctanh}\left(\frac{2c\,x^2+b}{\sqrt{-4ac+b^2}}\right)}{\left(-4ac+b^2\right)^{\frac{5}{2}}}$$

command

```
integrate(x**5*(B*x**2+A)/(c*x**4+b*x**2+a)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\sqrt{-\frac{1}{(4ac-b^2)^5}}\left(-2Aac-Ab^2+3Bab\right)\log\left(x^2+\frac{-2Aabc-Ab^3+3Bab^2-64a^3c^3\sqrt{-\frac{1}{(4ac-b^2)^5}}\left(-2Aac-Ab^2+3Bab\right)+48a^{2}\right.$$

$$-\sqrt{-\frac{1}{(4ac-b^2)^5}}\left(-2Aac-Ab^2+3Bab\right)\log\left(x^2+\frac{-2Aabc-Ab^3+3Bab^2+64a^3c^3\sqrt{-\frac{1}{(4ac-b^2)^5}}\left(-2Aac-Ab^2+3Bab\right)-4\right.$$

$$+\frac{6Aa^2bc-8Ba^3c-Ba^2b^2+x^6\left(4Aac^3+2Ab^2c^2-6Babc^2\right)+x^4\left(6Aabc^2+3Ab^3c-16Ba^2c^2-Bab^2c-Bb^4\right)}{64a^4c^3-32a^3b^2c^2+4a^2b^4c+x^8\left(64a^2c^5-32ab^2c^4+4b^4c^3\right)+x^6\left(128a^2bc^4-64ab^3c^3+8b^5c^2\right)+x^4\left(128a^3c^4-2\right.}$$

25 Test file number 42

Test folder name:

`test_cases/1_Algebraic_functions/1.2_Trinomial_products/1.2.2_Quartic/42_1.2.2.5_P-x-a+b_x^2+c_x^4-^p`

25.1 Problem number 27

$$\int \frac{d+ex+fx^2}{\left(4-5x^2+x^4\right)^2}\,dx$$

Optimal antiderivative

$$\frac{e\left(-2x^2+5\right)}{18x^4-90x^2+72}+\frac{x\left(17d+20f-\left(5d+8f\right)x^2\right)}{72x^4-360x^2+288}+\frac{\left(19d+52f\right)\operatorname{arctanh}\left(\frac{x}{2}\right)}{432}$$
$$-\frac{\left(d+7f\right)\operatorname{arctanh}(x)}{54}+\frac{e\ln\left(-x^2+1\right)}{27}-\frac{e\ln\left(-x^2+4\right)}{27}$$

command

```
integrate((f*x**2+e*x+d)/(x**4-5*x**2+4)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

output too large to display

25.2 Problem number 43

$$\int \frac{d+ex+fx^2}{\left(4-5x^2+x^4\right)^3}\,dx$$

Optimal antiderivative

$$\frac{e\left(-2x^2+5\right)}{36\left(x^4-5x^2+4\right)^2}+\frac{x\left(17d+20f-\left(5d+8f\right)x^2\right)}{144\left(x^4-5x^2+4\right)^2}-\frac{e\left(-2x^2+5\right)}{54\left(x^4-5x^2+4\right)}$$
$$-\frac{x\left(59d+380f-35(d+4f)\,x^2\right)}{3456\left(x^4-5x^2+4\right)}-\frac{\left(313d+820f\right)\operatorname{arctanh}\left(\frac{x}{2}\right)}{20736}$$
$$+\frac{\left(13d+25f\right)\operatorname{arctanh}(x)}{648}-\frac{e\ln\left(-x^2+1\right)}{81}+\frac{e\ln\left(-x^2+4\right)}{81}$$

command

```
integrate((f*x**2+e*x+d)/(x**4-5*x**2+4)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

output too large to display

26 Test file number 43

Test folder name:

```
test_cases/1_Algebraic_functions/1.2_Trinomial_products/1.2.2_Quartic/43_1.2.2.6_P-x-d_x-^m-a+b_x^2+c_x^4-^p
```

26.1 Problem number 64

$$\int \frac{x\left(d+ex^2+fx^4\right)}{\left(a+bx^2+cx^4\right)^2}\,dx$$

Optimal antiderivative

$$\frac{2ace-b(af+cd)-\left(-2acf+b^2f-bce+2c^2d\right)x^2}{2c\left(-4ac+b^2\right)\left(c\,x^4+b\,x^2+a\right)}+\frac{\left(2af-be+2cd\right)\operatorname{arctanh}\left(\frac{2c\,x^2+b}{\sqrt{-4ac+b^2}}\right)}{\left(-4ac+b^2\right)^{\frac{3}{2}}}$$

command

```
integrate(x*(f*x**4+e*x**2+d)/(c*x**4+b*x**2+a)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{\sqrt{-\frac{1}{(4ac-b^2)^3}}\,(2af-be+2cd)\log\left(x^2+\frac{-16a^2c^2\sqrt{-\frac{1}{(4ac-b^2)^3}}\,(2af-be+2cd)+8ab^2c\sqrt{-\frac{1}{(4ac-b^2)^3}}\,(2af-be+2c}{4acf-2bce+4c^2d}\right.}{2}$$

$$+\frac{\sqrt{-\frac{1}{(4ac-b^2)^3}}\,(2af-be+2cd)\log\left(x^2+\frac{16a^2c^2\sqrt{-\frac{1}{(4ac-b^2)^3}}\,(2af-be+2cd)-8ab^2c\sqrt{-\frac{1}{(4ac-b^2)^3}}\,(2af-be+2cd)}{4acf-2bce+4c^2d}\right.}{2}$$

$$+\frac{abf-2ace+bcd+x^2\left(-2acf+b^2f-bce+2c^2d\right)}{8a^2c^2-2ab^2c+x^4\left(8ac^3-2b^2c^2\right)+x^2\left(8abc^2-2b^3c\right)}$$

26.2 Problem number 136

$$\int \frac{a+bx^2+cx^4}{x^3\sqrt{d-ex}\,\sqrt{d+ex}}\,dx$$

Optimal antiderivative

$$-\frac{\left(a\,e^2+2b\,d^2\right)\operatorname{arctanh}\left(\frac{\sqrt{-ex+d}\,\sqrt{ex+d}}{d}\right)}{2d^3}-\frac{c\sqrt{-ex+d}\,\sqrt{ex+d}}{e^2}-\frac{a\sqrt{-ex+d}\,\sqrt{ex+d}}{2d^2x^2}$$

command

```
integrate((c*x**4+b*x**2+a)/x**3/(-e*x+d)**(1/2)/(e*x+d)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{iae^2G_{6,6}^{5,3}\left(\begin{matrix}\frac{7}{4},\frac{9}{4},1 & 2,2,\frac{5}{2}\\ \frac{3}{2},\frac{7}{4},2,\frac{9}{4},\frac{5}{2} & 0\end{matrix}\middle|\frac{d^2}{e^2x^2}\right)}{4\pi^{\frac{3}{2}}d^3}-\frac{ae^2G_{6,6}^{2,6}\left(\begin{matrix}1,\frac{5}{4},\frac{3}{2},\frac{7}{4},2,1 & \\ \frac{5}{4},\frac{7}{4} & 1,\frac{3}{2},\frac{3}{2},0\end{matrix}\middle|\frac{d^2e^{-2i\pi}}{e^2x^2}\right)}{4\pi^{\frac{3}{2}}d^3}$$
$$+\frac{ibG_{6,6}^{5,3}\left(\begin{matrix}\frac{3}{4},\frac{5}{4},1 & 1,1,\frac{3}{2}\\ \frac{1}{2},\frac{3}{4},1,\frac{5}{4},\frac{3}{2} & 0\end{matrix}\middle|\frac{d^2}{e^2x^2}\right)}{4\pi^{\frac{3}{2}}d}-\frac{bG_{6,6}^{2,6}\left(\begin{matrix}0,\frac{1}{4},\frac{1}{2},\frac{3}{4},1,1 & \\ \frac{1}{4},\frac{3}{4} & 0,\frac{1}{2},\frac{1}{2},0\end{matrix}\middle|\frac{d^2e^{-2i\pi}}{e^2x^2}\right)}{4\pi^{\frac{3}{2}}d}$$
$$-\frac{icdG_{6,6}^{6,2}\left(\begin{matrix}-\frac{1}{4},\frac{1}{4} & 0,0,\frac{1}{2},1\\ -\frac{1}{2},-\frac{1}{4},0,\frac{1}{4},\frac{1}{2},0 & \end{matrix}\middle|\frac{d^2}{e^2x^2}\right)}{4\pi^{\frac{3}{2}}e^2}$$
$$-\frac{cdG_{6,6}^{2,6}\left(\begin{matrix}-1,-\frac{3}{4},-\frac{1}{2},-\frac{1}{4},0,1 & \\ -\frac{3}{4},-\frac{1}{4} & -1,-\frac{1}{2},-\frac{1}{2},0\end{matrix}\middle|\frac{d^2e^{-2i\pi}}{e^2x^2}\right)}{4\pi^{\frac{3}{2}}e^2}$$

26.3 Problem number 141

$$\int \frac{a+bx^2+cx^4}{x^2\sqrt{d-ex}\,\sqrt{d+ex}}\,dx$$

Optimal antiderivative

$$-\frac{\left(2b\,e^2+c\,d^2\right)\arctan\left(\frac{\sqrt{-ex+d}}{\sqrt{ex+d}}\right)}{e^3}+\frac{cx(ex-d)\sqrt{ex+d}}{2e^2\sqrt{-ex+d}}-\frac{a\sqrt{-ex+d}\,\sqrt{ex+d}}{d^2x}$$

command

```
integrate((c*x**4+b*x**2+a)/x**2/(-e*x+d)**(1/2)/(e*x+d)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{iaeG_{6,6}^{5,3}\left(\begin{matrix}\frac{5}{4},\frac{7}{4},1 & \frac{3}{2},\frac{3}{2},2\\ 1,\frac{5}{4},\frac{3}{2},\frac{7}{4},2 & 0\end{matrix}\middle|\frac{d^2}{e^2x^2}\right)}{4\pi^{\frac{3}{2}}d^2}+\frac{aeG_{6,6}^{2,6}\left(\begin{matrix}\frac{1}{2},\frac{3}{4},1,\frac{5}{4},\frac{3}{2},1 & \\ \frac{3}{4},\frac{5}{4} & \frac{1}{2},1,1,0\end{matrix}\middle|\frac{d^2e^{-2i\pi}}{e^2x^2}\right)}{4\pi^{\frac{3}{2}}d^2}$$
$$-\frac{ibG_{6,6}^{6,2}\left(\begin{matrix}\frac{1}{4},\frac{3}{4} & \frac{1}{2},\frac{1}{2},1,1\\ 0,\frac{1}{4},\frac{1}{2},\frac{3}{4},1,0 & \end{matrix}\middle|\frac{d^2}{e^2x^2}\right)}{4\pi^{\frac{3}{2}}e}+\frac{bG_{6,6}^{2,6}\left(\begin{matrix}-\frac{1}{2},-\frac{1}{4},0,\frac{1}{4},\frac{1}{2},1 & \\ -\frac{1}{4},\frac{1}{4} & -\frac{1}{2},0,0,0\end{matrix}\middle|\frac{d^2e^{-2i\pi}}{e^2x^2}\right)}{4\pi^{\frac{3}{2}}e}$$
$$-\frac{icd^2G_{6,6}^{6,2}\left(\begin{matrix}-\frac{3}{4},-\frac{1}{4} & -\frac{1}{2},-\frac{1}{2},0,1\\ -1,-\frac{3}{4},-\frac{1}{2},-\frac{1}{4},0,0 & \end{matrix}\middle|\frac{d^2}{e^2x^2}\right)}{4\pi^{\frac{3}{2}}e^3}$$
$$+\frac{cd^2G_{6,6}^{2,6}\left(\begin{matrix}-\frac{3}{2},-\frac{5}{4},-1,-\frac{3}{4},-\frac{1}{2},1 & \\ -\frac{5}{4},-\frac{3}{4} & -\frac{3}{2},-1,-1,0\end{matrix}\middle|\frac{d^2e^{-2i\pi}}{e^2x^2}\right)}{4\pi^{\frac{3}{2}}e^3}$$

27 Test file number 46

Test folder name:

`test_cases/1_Algebraic_functions/1.2_Trinomial_products/1.2.3_General/46_1.2.3.2-d_x-^m-a+b_x^n+c_x^-2_n-^p`

27.1 Problem number 142

$$\int \frac{1}{x^4\left(a+bx^3+cx^6\right)}\,dx$$

Optimal antiderivative

$$-\frac{1}{3a\,x^3}-\frac{b\ln(x)}{a^2}+\frac{b\ln\left(c\,x^6+b\,x^3+a\right)}{6a^2}-\frac{\left(-2ac+b^2\right)\operatorname{arctanh}\left(\frac{2c\,x^3+b}{\sqrt{-4ac+b^2}}\right)}{3a^2\sqrt{-4ac+b^2}}$$

command

```
integrate(1/x**4/(c*x**6+b*x**3+a),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\left(\frac{b}{6a^2}\right.$$

$$\left.-\frac{\sqrt{-4ac+b^2}\left(2ac-b^2\right)}{6a^2\left(4ac-b^2\right)}\right)\log\left(x^3+\frac{-12a^3c\left(\frac{b}{6a^2}-\frac{\sqrt{-4ac+b^2}\left(2ac-b^2\right)}{6a^2(4ac-b^2)}\right)+3a^2b^2\left(\frac{b}{6a^2}-\frac{\sqrt{-4ac+b^2}\left(2ac-b^2\right)}{6a^2(4ac-b^2)}\right.}{2ac^2-b^2c}\right.$$

$$+\left(\frac{b}{6a^2}\right.$$

$$\left.+\frac{\sqrt{-4ac+b^2}\left(2ac-b^2\right)}{6a^2\left(4ac-b^2\right)}\right)\log\left(x^3+\frac{-12a^3c\left(\frac{b}{6a^2}+\frac{\sqrt{-4ac+b^2}\left(2ac-b^2\right)}{6a^2(4ac-b^2)}\right)+3a^2b^2\left(\frac{b}{6a^2}+\frac{\sqrt{-4ac+b^2}\left(2ac-b^2\right)}{6a^2(4ac-b^2)}\right.}{2ac^2-b^2c}\right.$$

$$-\frac{1}{3ax^3}-\frac{b\log\left(x\right)}{a^2}$$

27.2 Problem number 150

$$\int\frac{1}{x^3\left(a+bx^3+cx^6\right)}\,dx$$

Optimal antiderivative

$$-\frac{1}{2a\,x^2}-\frac{c^{\frac{2}{3}}\ln\left(2^{\frac{1}{3}}c^{\frac{1}{3}}x+\left(b-\sqrt{-4ac+b^2}\right)^{\frac{1}{3}}\right)\left(1+\frac{b}{\sqrt{-4ac+b^2}}\right)2^{\frac{2}{3}}}{6a\left(b-\sqrt{-4ac+b^2}\right)^{\frac{2}{3}}}$$
$$+\frac{c^{\frac{2}{3}}\ln\left(2^{\frac{2}{3}}c^{\frac{2}{3}}x^2-2^{\frac{1}{3}}c^{\frac{1}{3}}x\left(b-\sqrt{-4ac+b^2}\right)^{\frac{1}{3}}+\left(b-\sqrt{-4ac+b^2}\right)^{\frac{2}{3}}\right)\left(1+\frac{b}{\sqrt{-4ac+b^2}}\right)2^{\frac{2}{3}}}{12a\left(b-\sqrt{-4ac+b^2}\right)^{\frac{2}{3}}}$$
$$+\frac{c^{\frac{2}{3}}\arctan\left(\frac{\left(1-\frac{2\,2^{\frac{1}{3}}c^{\frac{1}{3}}x}{\left(b-\sqrt{-4ac+b^2}\right)^{\frac{1}{3}}}\right)\sqrt{3}}{3}\right)\left(1+\frac{b}{\sqrt{-4ac+b^2}}\right)2^{\frac{2}{3}}\sqrt{3}}{6a\left(b-\sqrt{-4ac+b^2}\right)^{\frac{2}{3}}}$$
$$-\frac{c^{\frac{2}{3}}\ln\left(2^{\frac{1}{3}}c^{\frac{1}{3}}x+\left(b+\sqrt{-4ac+b^2}\right)^{\frac{1}{3}}\right)\left(1-\frac{b}{\sqrt{-4ac+b^2}}\right)2^{\frac{2}{3}}}{6a\left(b+\sqrt{-4ac+b^2}\right)^{\frac{2}{3}}}$$
$$+\frac{c^{\frac{2}{3}}\ln\left(2^{\frac{2}{3}}c^{\frac{2}{3}}x^2-2^{\frac{1}{3}}c^{\frac{1}{3}}x\left(b+\sqrt{-4ac+b^2}\right)^{\frac{1}{3}}+\left(b+\sqrt{-4ac+b^2}\right)^{\frac{2}{3}}\right)\left(1-\frac{b}{\sqrt{-4ac+b^2}}\right)2^{\frac{2}{3}}}{12a\left(b+\sqrt{-4ac+b^2}\right)^{\frac{2}{3}}}$$
$$+\frac{c^{\frac{2}{3}}\arctan\left(\frac{\left(1-\frac{2\,2^{\frac{1}{3}}c^{\frac{1}{3}}x}{\left(b+\sqrt{-4ac+b^2}\right)^{\frac{1}{3}}}\right)\sqrt{3}}{3}\right)\left(1-\frac{b}{\sqrt{-4ac+b^2}}\right)2^{\frac{2}{3}}\sqrt{3}}{6a\left(b+\sqrt{-4ac+b^2}\right)^{\frac{2}{3}}}$$

command

```
integrate(1/x**3/(c*x**6+b*x**3+a),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\text{RootSum}\left(t^6\left(46656a^8c^3-34992a^7b^2c^2+8748a^6b^4c-729a^5b^6\right)+t^3\left(-432a^4c^4+1512a^3b^2c^3-1107a^2b^4c^2+297a\right.\right.$$

$$-\frac{1}{2ax^2}$$

27.3 Problem number 321

$$\int \frac{x^6}{a+bx^4+cx^8}\,dx$$

Optimal antiderivative

$$-\frac{\arctan\left(\frac{2^{\frac{1}{4}}c^{\frac{1}{4}}x}{\left(-b-\sqrt{-4ac+b^2}\right)^{\frac{1}{4}}}\right)\left(-b-\sqrt{-4ac+b^2}\right)^{\frac{3}{4}}2^{\frac{1}{4}}}{4c^{\frac{3}{4}}\sqrt{-4ac+b^2}}$$

$$+\frac{\operatorname{arctanh}\left(\frac{2^{\frac{1}{4}}c^{\frac{1}{4}}x}{\left(-b-\sqrt{-4ac+b^2}\right)^{\frac{1}{4}}}\right)\left(-b-\sqrt{-4ac+b^2}\right)^{\frac{3}{4}}2^{\frac{1}{4}}}{4c^{\frac{3}{4}}\sqrt{-4ac+b^2}}$$

$$+\frac{\arctan\left(\frac{2^{\frac{1}{4}}c^{\frac{1}{4}}x}{\left(-b+\sqrt{-4ac+b^2}\right)^{\frac{1}{4}}}\right)\left(-b+\sqrt{-4ac+b^2}\right)^{\frac{3}{4}}2^{\frac{1}{4}}}{4c^{\frac{3}{4}}\sqrt{-4ac+b^2}}$$

$$-\frac{\operatorname{arctanh}\left(\frac{2^{\frac{1}{4}}c^{\frac{1}{4}}x}{\left(-b+\sqrt{-4ac+b^2}\right)^{\frac{1}{4}}}\right)\left(-b+\sqrt{-4ac+b^2}\right)^{\frac{3}{4}}2^{\frac{1}{4}}}{4c^{\frac{3}{4}}\sqrt{-4ac+b^2}}$$

command

```
integrate(x**6/(c*x**8+b*x**4+a),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\text{RootSum}\left(t^8\left(16777216a^4c^7-16777216a^3b^2c^6+6291456a^2b^4c^5-1048576ab^6c^4+65536b^8c^3\right)+t^4\left(-12288a^3bc^3-\right.\right.$$

27.4 Problem number 324

$$\int \frac{1}{a+bx^4+cx^8}\,dx$$

Optimal antiderivative

$$\frac{c^{\frac{3}{4}}\arctan\left(\frac{2^{\frac{1}{4}}c^{\frac{1}{4}}x}{\left(-b-\sqrt{-4ac+b^2}\right)^{\frac{1}{4}}}\right)2^{\frac{3}{4}}}{2\left(-b-\sqrt{-4ac+b^2}\right)^{\frac{3}{4}}\sqrt{-4ac+b^2}}+\frac{c^{\frac{3}{4}}\operatorname{arctanh}\left(\frac{2^{\frac{1}{4}}c^{\frac{1}{4}}x}{\left(-b-\sqrt{-4ac+b^2}\right)^{\frac{1}{4}}}\right)2^{\frac{3}{4}}}{2\left(-b-\sqrt{-4ac+b^2}\right)^{\frac{3}{4}}\sqrt{-4ac+b^2}}$$
$$-\frac{c^{\frac{3}{4}}\arctan\left(\frac{2^{\frac{1}{4}}c^{\frac{1}{4}}x}{\left(-b+\sqrt{-4ac+b^2}\right)^{\frac{1}{4}}}\right)2^{\frac{3}{4}}}{2\sqrt{-4ac+b^2}\left(-b+\sqrt{-4ac+b^2}\right)^{\frac{3}{4}}}-\frac{c^{\frac{3}{4}}\operatorname{arctanh}\left(\frac{2^{\frac{1}{4}}c^{\frac{1}{4}}x}{\left(-b+\sqrt{-4ac+b^2}\right)^{\frac{1}{4}}}\right)2^{\frac{3}{4}}}{2\sqrt{-4ac+b^2}\left(-b+\sqrt{-4ac+b^2}\right)^{\frac{3}{4}}}$$

command

```
integrate(1/(c*x**8+b*x**4+a),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\text{RootSum}\left(t^8\left(16777216a^7c^4-16777216a^6b^2c^3+6291456a^5b^4c^2-1048576a^4b^6c+65536a^3b^8\right)+t^4\left(-12288a^3bc^3+\right.\right.$$

27.5 Problem number 502

$$\int \frac{x^{-1+\frac{n}{2}}}{bx^n+cx^{2n}}\,dx$$

Optimal antiderivative

$$-\frac{2x^{-\frac{n}{2}}}{bn}+\frac{2\arctan\left(\frac{\sqrt{b}\,x^{-\frac{n}{2}}}{\sqrt{c}}\right)\sqrt{c}}{b^{\frac{3}{2}}n}$$

command

```
integrate(x**(-1+1/2*n)/(b*x**n+c*x**(2*n)),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{2\operatorname{atan}\left(\frac{x^{\frac{n}{2}}}{\sqrt{\frac{b}{c}}}\right)}{bn\sqrt{\frac{b}{c}}}-\frac{2x^{-\frac{n}{2}}}{bn}$$

27.6 Problem number 503

$$\int \frac{x^{-1-\frac{n}{2}}}{bx^n+cx^{2n}}\,dx$$

Optimal antiderivative

$$-\frac{2x^{-\frac{3n}{2}}}{3bn}+\frac{2c\,x^{-\frac{n}{2}}}{b^2n}-\frac{2c^{\frac{3}{2}}\arctan\left(\frac{\sqrt{b}\,x^{-\frac{n}{2}}}{\sqrt{c}}\right)}{b^{\frac{5}{2}}n}$$

command

```
integrate(x**(-1-1/2*n)/(b*x**n+c*x**(2*n)),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{2x^{-\frac{3n}{2}}}{3bn}+\frac{2cx^{-\frac{n}{2}}}{b^2n}-\frac{2c^2\operatorname{atan}\left(\frac{x^{-\frac{n}{2}}}{\sqrt{\frac{c}{b}}}\right)}{b^3n\sqrt{\frac{c}{b}}}$$

27.7 Problem number 619

$$\int \frac{1}{(d+ex)^3\left(a+b(d+ex)^2+c(d+ex)^4\right)}\,dx$$

Optimal antiderivative

$$-\frac{1}{2ae\left(ex+d\right)^2}-\frac{b\ln(ex+d)}{a^2e}+\frac{b\ln\left(a+b(ex+d)^2+c(ex+d)^4\right)}{4a^2e}$$
$$-\frac{\left(-2ac+b^2\right)\operatorname{arctanh}\left(\frac{b+2c(ex+d)^2}{\sqrt{-4ac+b^2}}\right)}{2a^2e\sqrt{-4ac+b^2}}$$

command

```
integrate(1/(e*x+d)**3/(a+b*(e*x+d)**2+c*(e*x+d)**4),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\left(\frac{b}{4a^2e}\right.$$
$$\left.-\frac{\sqrt{-4ac+b^2}\left(2ac-b^2\right)}{4a^2e\left(4ac-b^2\right)}\right)\log\left(\frac{2dx}{e}+x^2+\frac{-8a^3ce\left(\frac{b}{4a^2e}-\frac{\sqrt{-4ac+b^2}\,(2ac-b^2)}{4a^2e(4ac-b^2)}\right)+2a^2b^2e\left(\frac{b}{4a^2e}-\frac{\sqrt{-4ac+\right.}\right.}{2ac^2e^2-b^2ce^2}$$
$$+\left(\frac{b}{4a^2e}\right.$$
$$\left.+\frac{\sqrt{-4ac+b^2}\left(2ac-b^2\right)}{4a^2e\left(4ac-b^2\right)}\right)\log\left(\frac{2dx}{e}+x^2+\frac{-8a^3ce\left(\frac{b}{4a^2e}+\frac{\sqrt{-4ac+b^2}\,(2ac-b^2)}{4a^2e(4ac-b^2)}\right)+2a^2b^2e\left(\frac{b}{4a^2e}+\frac{\sqrt{-4ac+}\right.}{2ac^2e^2-b^2ce^2}$$
$$-\frac{1}{2ad^2e+4ade^2x+2ae^3x^2}-\frac{b\log\left(\frac{d}{e}+x\right)}{a^2e}$$

27.8 Problem number 623

$$\int \frac{(d+ex)^2}{\left(a+b(d+ex)^2+c(d+ex)^4\right)^2}\,dx$$

Optimal antiderivative

$$-\frac{(ex+d)\left(b+2c(ex+d)^2\right)}{2\left(-4ac+b^2\right)e\left(a+b\left(ex+d\right)^2+c\left(ex+d\right)^4\right)}$$
$$+\frac{\arctan\left(\frac{(ex+d)\sqrt{2}\ \sqrt{c}}{\sqrt{b-\sqrt{-4ac+b^2}}}\right)\sqrt{c}\ \left(2b-\sqrt{-4ac+b^2}\right)\sqrt{2}}{2\left(-4ac+b^2\right)^{\frac{3}{2}}e\sqrt{b-\sqrt{-4ac+b^2}}}$$
$$-\frac{\arctan\left(\frac{(ex+d)\sqrt{2}\ \sqrt{c}}{\sqrt{b+\sqrt{-4ac+b^2}}}\right)\sqrt{c}\ \left(2b+\sqrt{-4ac+b^2}\right)\sqrt{2}}{2\left(-4ac+b^2\right)^{\frac{3}{2}}e\sqrt{b+\sqrt{-4ac+b^2}}}$$

command

```
integrate((e*x+d)**2/(a+b*(e*x+d)**2+c*(e*x+d)**4)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{bd+2cd^3+6cde^2x^2+2ce^3x^3+x(be}{8a^2ce-2ab^2e+8abcd^2e+8ac^2d^4e-2b^3d^2e-2b^2cd^4e+x^4\left(8ac^2e^5-2b^2ce^5\right)+x^3\left(32ac^2de^4-8b^2cde^4\right)+x^2\left(8a}$$
$$+\text{RootSum}\left(t^4(1048576a^7c^6e^4-1572864a^6b^2c^5e^4+983040a^5b^4c^4e^4-327680a^4b^6c^3e^4+61440a^3b^8c^2e^4-6144a^2b\right.$$

27.9 Problem number 644

$$\int \frac{1}{(df+efx)^3\left(a+b(d+ex)^2+c(d+ex)^4\right)}\,dx$$

Optimal antiderivative

$$-\frac{1}{2ae\,f^3\left(ex+d\right)^2}-\frac{b\ln(ex+d)}{a^2e\,f^3}+\frac{b\ln\left(a+b(ex+d)^2+c(ex+d)^4\right)}{4a^2e\,f^3}$$
$$-\frac{\left(-2ac+b^2\right)\operatorname{arctanh}\left(\frac{b+2c(ex+d)^2}{\sqrt{-4ac+b^2}}\right)}{2a^2e\,f^3\sqrt{-4ac+b^2}}$$

command

```
integrate(1/(e*f*x+d*f)**3/(a+b*(e*x+d)**2+c*(e*x+d)**4),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\left(\frac{b}{4a^2ef^3}\right.$$

$$\left.-\frac{\sqrt{-4ac+b^2}\left(2ac-b^2\right)}{4a^2ef^3\left(4ac-b^2\right)}\right)\log\left(\frac{2dx}{e}+x^2+\frac{-8a^3cef^3\left(\frac{b}{4a^2ef^3}-\frac{\sqrt{-4ac+b^2}\,(2ac-b^2)}{4a^2ef^3(4ac-b^2)}\right)+2a^2b^2ef^3\left(\frac{b}{4a^2ef^3}-\sqrt{}\right.}{2ac^2e^2-b^2ce^2}\right.$$

$$+\left(\frac{b}{4a^2ef^3}\right.$$

$$\left.+\frac{\sqrt{-4ac+b^2}\left(2ac-b^2\right)}{4a^2ef^3\left(4ac-b^2\right)}\right)\log\left(\frac{2dx}{e}+x^2+\frac{-8a^3cef^3\left(\frac{b}{4a^2ef^3}+\frac{\sqrt{-4ac+b^2}\,(2ac-b^2)}{4a^2ef^3(4ac-b^2)}\right)+2a^2b^2ef^3\left(\frac{b}{4a^2ef^3}+\sqrt{}\right.}{2ac^2e^2-b^2ce^2}\right.$$

$$-\frac{1}{2ad^2ef^3+4ade^2f^3x+2ae^3f^3x^2}-\frac{b\log\left(\frac{d}{e}+x\right)}{a^2ef^3}$$

27.10 Problem number 648

$$\int\frac{(df+efx)^2}{\left(a+b(d+ex)^2+c(d+ex)^4\right)^2}\,dx$$

Optimal antiderivative

$$-\frac{f^2(ex+d)\left(b+2c(ex+d)^2\right)}{2\left(-4ac+b^2\right)e\left(a+b\left(ex+d\right)^2+c\left(ex+d\right)^4\right)}$$

$$+\frac{f^2\arctan\left(\frac{(ex+d)\sqrt{2}\,\sqrt{c}}{\sqrt{b-\sqrt{-4ac+b^2}}}\right)\sqrt{c}\,\left(2b-\sqrt{-4ac+b^2}\right)\sqrt{2}}{2\left(-4ac+b^2\right)^{\frac{3}{2}}e\sqrt{b-\sqrt{-4ac+b^2}}}$$

$$-\frac{f^2\arctan\left(\frac{(ex+d)\sqrt{2}\,\sqrt{c}}{\sqrt{b+\sqrt{-4ac+b^2}}}\right)\sqrt{c}\,\left(2b+\sqrt{-4ac+b^2}\right)\sqrt{2}}{2\left(-4ac+b^2\right)^{\frac{3}{2}}e\sqrt{b+\sqrt{-4ac+b^2}}}$$

command

```
integrate((e*f*x+d*f)**2/(a+b*(e*x+d)**2+c*(e*x+d)**4)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{bdf^2+2cd^3f^2+6cde^2f^2x^2+2ce^3f^2x^3+x(}{8a^2ce-2ab^2e+8abcd^2e+8ac^2d^4e-2b^3d^2e-2b^2cd^4e+x^4\left(8ac^2e^5-2b^2ce^5\right)+x^3\left(32ac^2de^4-8b^2cde^4\right)+x^2\left(8a\right.}$$
$$+\text{RootSum}\left(t^4\left(1048576a^7c^6e^4-1572864a^6b^2c^5e^4+983040a^5b^4c^4e^4-327680a^4b^6c^3e^4+61440a^3b^8c^2e^4-6144a^2b\right.\right.$$

28 Test file number 48

Test folder name:

```
test_cases/1_Algebraic_functions/1.2_Trinomial_products/1.2.3_General/48_1.2.3.4-f_x-
^m-d+e_x^n-^q-a+b_x^n+c_x^-2_n-^p
```

28.1 Problem number 9

$$\int \frac{x^8\left(d+ex^3\right)}{a+bx^3+cx^6}\,dx$$

Optimal antiderivative

$$\frac{(-be+cd)\,x^3}{3c^2}+\frac{e\,x^6}{6c}-\frac{\left(ace-b^2e+bcd\right)\ln\left(c\,x^6+b\,x^3+a\right)}{6c^3}$$
$$-\frac{\left(3abce-2a\,c^2d-b^3e+b^2cd\right)\operatorname{arctanh}\left(\frac{2c\,x^3+b}{\sqrt{-4ac+b^2}}\right)}{3c^3\sqrt{-4ac+b^2}}$$

command

```
integrate(x**8*(e*x**3+d)/(c*x**6+b*x**3+a),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$x^3\left(-\frac{be}{3c^2}+\frac{d}{3c}\right)+\left(-\frac{\sqrt{-4ac+b^2}\left(3abce-2ac^2d-b^3e+b^2cd\right)}{6c^3\left(4ac-b^2\right)}\right.$$

$$\left.-\frac{ace-b^2e+bcd}{6c^3}\right)\log\left(x^3+\frac{2a^2ce-ab^2e+abcd+12ac^3\left(-\frac{\sqrt{-4ac+b^2}\ (3abce-2ac^2d-b^3e+b^2cd)}{6c^3(4ac-b^2)}-\frac{ace-b^2e+bcd}{6c^3}\right)-}{3abce-2ac^2d-b^3e+b^2}\right.$$

$$+\left(\frac{\sqrt{-4ac+b^2}\left(3abce-2ac^2d-b^3e+b^2cd\right)}{6c^3\left(4ac-b^2\right)}\right.$$

$$\left.-\frac{ace-b^2e+bcd}{6c^3}\right)\log\left(x^3+\frac{2a^2ce-ab^2e+abcd+12ac^3\left(\frac{\sqrt{-4ac+b^2}\ (3abce-2ac^2d-b^3e+b^2cd)}{6c^3(4ac-b^2)}-\frac{ace-b^2e+bcd}{6c^3}\right)-}{3abce-2ac^2d-b^3e+b^2c}\right.$$

$$+\frac{ex^6}{6c}$$

29 Test file number 50

Test folder name:

`test_cases/1_Algebraic_functions/1.2_Trinomial_products/1.2.4_Improper/50_1.2.4.2-d_x-^m-a_x^q+b_x^n+c_x^-2_n-q-^p`

29.1 Problem number 88

$$\int \frac{1}{x^2\left(ax+bx^3+cx^5\right)}\,dx$$

Optimal antiderivative

$$-\frac{1}{2a\,x^2}-\frac{b\ln(x)}{a^2}+\frac{b\ln\left(c\,x^4+b\,x^2+a\right)}{4a^2}-\frac{\left(-2ac+b^2\right)\operatorname{arctanh}\left(\frac{2c\,x^2+b}{\sqrt{-4ac+b^2}}\right)}{2a^2\sqrt{-4ac+b^2}}$$

command

```
integrate(1/x**2/(c*x**5+b*x**3+a*x),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\left(\frac{b}{4a^2}\right.$$

$$\left.-\frac{\sqrt{-4ac+b^2}\,\left(2ac-b^2\right)}{4a^2\left(4ac-b^2\right)}\right)\log\left(x^2+\frac{-8a^3c\left(\frac{b}{4a^2}-\frac{\sqrt{-4ac+b^2}\,\left(2ac-b^2\right)}{4a^2\left(4ac-b^2\right)}\right)+2a^2b^2\left(\frac{b}{4a^2}-\frac{\sqrt{-4ac+b^2}\,\left(2ac-b^2\right)}{4a^2\left(4ac-b^2\right)}\right.\right.}{2ac^2-b^2c}$$

$$+\left(\frac{b}{4a^2}\right.$$

$$\left.+\frac{\sqrt{-4ac+b^2}\,\left(2ac-b^2\right)}{4a^2\left(4ac-b^2\right)}\right)\log\left(x^2+\frac{-8a^3c\left(\frac{b}{4a^2}+\frac{\sqrt{-4ac+b^2}\,\left(2ac-b^2\right)}{4a^2\left(4ac-b^2\right)}\right)+2a^2b^2\left(\frac{b}{4a^2}+\frac{\sqrt{-4ac+b^2}\,\left(2ac-b^2\right)}{4a^2\left(4ac-b^2\right)}\right.\right.}{2ac^2-b^2c}$$

$$-\frac{1}{2ax^2}-\frac{b\log\left(x\right)}{a^2}$$

29.2 Problem number 89

$$\int\frac{x^{11}}{\left(ax+bx^3+cx^5\right)^2}\,dx$$

Optimal antiderivative

$$\frac{\left(-3ac+b^2\right)x^2}{c^2\left(-4ac+b^2\right)}-\frac{b\,x^4}{2c\left(-4ac+b^2\right)}+\frac{x^6\left(b\,x^2+2a\right)}{2\left(-4ac+b^2\right)\left(c\,x^4+b\,x^2+a\right)}$$
$$-\frac{\left(6a^2c^2-6a\,b^2c+b^4\right)\operatorname{arctanh}\left(\frac{2c\,x^2+b}{\sqrt{-4ac+b^2}}\right)}{c^3\left(-4ac+b^2\right)^{\frac{3}{2}}}-\frac{b\ln\left(c\,x^4+b\,x^2+a\right)}{2c^3}$$

command

```
integrate(x**11/(c*x**5+b*x**3+a*x)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\left(-\frac{b}{2c^3}\right.$$

$$\left.-\frac{\sqrt{-\left(4ac-b^2\right)^3}\left(6a^2c^2-6ab^2c+b^4\right)}{2c^3\left(64a^3c^3-48a^2b^2c^2+12ab^4c-b^6\right)}\right)\log\left(x^2+\frac{-5a^2bc-16a^2c^4\left(-\frac{b}{2c^3}-\frac{\sqrt{-\left(4ac-b^2\right)^3}\left(6a^2c^2-6ab^2c+b^4\right)}{2c^3\left(64a^3c^3-48a^2b^2c^2+12ab^4c-b^6\right)}\right)}{}\right.$$

$$+\left(-\frac{b}{2c^3}\right.$$

$$\left.+\frac{\sqrt{-\left(4ac-b^2\right)^3}\left(6a^2c^2-6ab^2c+b^4\right)}{2c^3\left(64a^3c^3-48a^2b^2c^2+12ab^4c-b^6\right)}\right)\log\left(x^2+\frac{-5a^2bc-16a^2c^4\left(-\frac{b}{2c^3}+\frac{\sqrt{-\left(4ac-b^2\right)^3}\left(6a^2c^2-6ab^2c+b^4\right)}{2c^3\left(64a^3c^3-48a^2b^2c^2+12ab^4c-b^6\right)}\right)}{}\right.$$

$$+\frac{-3a^2bc+ab^3+x^2\left(2a^2c^2-4ab^2c+b^4\right)}{8a^2c^4-2ab^2c^3+x^4\left(8ac^5-2b^2c^4\right)+x^2\left(8abc^4-2b^3c^3\right)}+\frac{x^2}{2c^2}$$

29.3 Problem number 91

$$\int\frac{x^9}{\left(ax+bx^3+cx^5\right)^2}\,dx$$

Optimal antiderivative

$$-\frac{b\,x^2}{2c\left(-4ac+b^2\right)}+\frac{x^4\left(b\,x^2+2a\right)}{2\left(-4ac+b^2\right)\left(c\,x^4+b\,x^2+a\right)}$$
$$+\frac{b\left(-6ac+b^2\right)\operatorname{arctanh}\left(\frac{2c\,x^2+b}{\sqrt{-4ac+b^2}}\right)}{2c^2\left(-4ac+b^2\right)^{\frac{3}{2}}}+\frac{\ln\left(c\,x^4+b\,x^2+a\right)}{4c^2}$$

command

```
integrate(x**9/(c*x**5+b*x**3+a*x)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\left(-\frac{b\sqrt{-\left(4ac-b^2\right)^3}\left(6ac-b^2\right)}{4c^2\left(64a^3c^3-48a^2b^2c^2+12ab^4c-b^6\right)}\right.$$

$$\left.+\frac{1}{4c^2}\right)\log\left(x^2+\frac{-32a^2c^3\left(-\frac{b\sqrt{-\left(4ac-b^2\right)^3}\left(6ac-b^2\right)}{4c^2\left(64a^3c^3-48a^2b^2c^2+12ab^4c-b^6\right)}+\frac{1}{4c^2}\right)+8a^2c+16ab^2c^2\left(-\frac{b\sqrt{-\left(4ac-b^2\right)^3}\left(6ac-b^2\right)}{4c^2\left(64a^3c^3-48a^2b^2c^2+12ab^4c-b^6\right)}\right.}{6abc-b^3}\right.$$

$$+\left(\frac{b\sqrt{-\left(4ac-b^2\right)^3}\left(6ac-b^2\right)}{4c^2\left(64a^3c^3-48a^2b^2c^2+12ab^4c-b^6\right)}\right.$$

$$\left.+\frac{1}{4c^2}\right)\log\left(x^2+\frac{-32a^2c^3\left(\frac{b\sqrt{-\left(4ac-b^2\right)^3}\left(6ac-b^2\right)}{4c^2\left(64a^3c^3-48a^2b^2c^2+12ab^4c-b^6\right)}+\frac{1}{4c^2}\right)+8a^2c+16ab^2c^2\left(\frac{b\sqrt{-\left(4ac-b^2\right)^3}\left(6ac-b^2\right)}{4c^2\left(64a^3c^3-48a^2b^2c^2+12ab^4c-b^6\right)}+\right.}{6abc-b^3}\right.$$

$$+\frac{2a^2c-ab^2+x^2\left(3abc-b^3\right)}{8a^2c^3-2ab^2c^2+x^4\left(8ac^4-2b^2c^3\right)+x^2\left(8abc^3-2b^3c^2\right)}$$

29.4 Problem number 92

$$\int\frac{x^8}{\left(ax+bx^3+cx^5\right)^2}\,dx$$

Optimal antiderivative

$$-\frac{bx}{2c\left(-4ac+b^2\right)}+\frac{x^3\left(b\,x^2+2a\right)}{2\left(-4ac+b^2\right)\left(c\,x^4+b\,x^2+a\right)}$$

$$+\frac{\arctan\left(\frac{x\sqrt{2}\,\sqrt{c}}{\sqrt{b-\sqrt{-4ac+b^2}}}\right)\left(b^2-6ac-\frac{b\left(-8ac+b^2\right)}{\sqrt{-4ac+b^2}}\right)\sqrt{2}}{4c^{\frac{3}{2}}\left(-4ac+b^2\right)\sqrt{b-\sqrt{-4ac+b^2}}}$$

$$+\frac{\arctan\left(\frac{x\sqrt{2}\,\sqrt{c}}{\sqrt{b+\sqrt{-4ac+b^2}}}\right)\left(b^2-6ac+\frac{b\left(-8ac+b^2\right)}{\sqrt{-4ac+b^2}}\right)\sqrt{2}}{4c^{\frac{3}{2}}\left(-4ac+b^2\right)\sqrt{b+\sqrt{-4ac+b^2}}}$$

command

```
integrate(x**8/(c*x**5+b*x**3+a*x)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{abx+x^3\left(-2ac+b^2\right)}{8a^2c^2-2ab^2c+x^4\left(8ac^3-2b^2c^2\right)+x^2\left(8abc^2-2b^3c\right)}$$
$$+\text{RootSum}\left(t^4\left(1048576a^6c^9-1572864a^5b^2c^8+983040a^4b^4c^7-327680a^3b^6c^6+61440a^2b^8c^5-6144ab^{10}c^4+256b\right.\right.$$

29.5 Problem number 96

$$\int \frac{x^4}{\left(ax+bx^3+cx^5\right)^2}\,dx$$

Optimal antiderivative

$$-\frac{x\left(2cx^2+b\right)}{2\left(-4ac+b^2\right)\left(cx^4+bx^2+a\right)}$$
$$+\frac{\arctan\left(\frac{x\sqrt{2}\,\sqrt{c}}{\sqrt{b-\sqrt{-4ac+b^2}}}\right)\sqrt{c}\,\left(2b-\sqrt{-4ac+b^2}\right)\sqrt{2}}{2\left(-4ac+b^2\right)^{\frac{3}{2}}\sqrt{b-\sqrt{-4ac+b^2}}}$$
$$-\frac{\arctan\left(\frac{x\sqrt{2}\,\sqrt{c}}{\sqrt{b+\sqrt{-4ac+b^2}}}\right)\sqrt{c}\,\left(2b+\sqrt{-4ac+b^2}\right)\sqrt{2}}{2\left(-4ac+b^2\right)^{\frac{3}{2}}\sqrt{b+\sqrt{-4ac+b^2}}}$$

command

```
integrate(x**4/(c*x**5+b*x**3+a*x)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{bx+2cx^3}{8a^2c-2ab^2+x^4\left(8ac^2-2b^2c\right)+x^2\left(8abc-2b^3\right)}$$
$$+\text{RootSum}\left(t^4\left(1048576a^7c^6-1572864a^6b^2c^5+983040a^5b^4c^4-327680a^4b^6c^3+61440a^3b^8c^2-6144a^2b^{10}c+256a\right.\right.$$

29.6 Problem number 98

$$\int \frac{x^2}{\left(ax+bx^3+cx^5\right)^2}\,dx$$

Optimal antiderivative

$$\frac{x\left(bc\,x^2-2ac+b^2\right)}{2a\left(-4ac+b^2\right)\left(c\,x^4+b\,x^2+a\right)}$$
$$+\frac{\arctan\left(\frac{x\sqrt{2}\,\sqrt{c}}{\sqrt{b-\sqrt{-4ac+b^2}}}\right)\sqrt{c}\,\left(b^2-12ac+b\sqrt{-4ac+b^2}\right)\sqrt{2}}{4a\left(-4ac+b^2\right)^{\frac{3}{2}}\sqrt{b-\sqrt{-4ac+b^2}}}$$
$$-\frac{\arctan\left(\frac{x\sqrt{2}\,\sqrt{c}}{\sqrt{b+\sqrt{-4ac+b^2}}}\right)\sqrt{c}\,\left(b^2-12ac-b\sqrt{-4ac+b^2}\right)\sqrt{2}}{4a\left(-4ac+b^2\right)^{\frac{3}{2}}\sqrt{b+\sqrt{-4ac+b^2}}}$$

command

```
integrate(x**2/(c*x**5+b*x**3+a*x)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{-bcx^3+x\left(2ac-b^2\right)}{8a^3c-2a^2b^2+x^4\left(8a^2c^2-2ab^2c\right)+x^2\left(8a^2bc-2ab^3\right)}$$
$$+\text{RootSum}\left(t^4\left(1048576a^9c^6-1572864a^8b^2c^5+983040a^7b^4c^4-327680a^6b^6c^3+61440a^5b^8c^2-6144a^4b^{10}c+256a\right.\right.$$

30 Test file number 51

Test folder name:

```
test_cases/1_Algebraic_functions/1.3_Miscellaneous/51_1.3.1_Rational_functions
```

30.1 Problem number 38

$$\int \frac{1}{\left(4ac+4c^2x^2+4cdx^3+d^2x^4\right)^2}\,dx$$

Optimal antiderivative

$$-\frac{\left(\frac{c}{d}+x\right)\left(c^3-4a\,d^2-c\,d^2\left(\frac{c}{d}+x\right)^2\right)}{16ac\left(4a\,d^2+c^3\right)\left(d^2x^4+4cd\,x^3+4c^2x^2+4ac\right)}$$

$$-\frac{d\arctanh\left(\frac{c\sqrt{2}+dx\sqrt{2}+c^{\frac{1}{4}}\sqrt{c^{\frac{3}{2}}+\sqrt{4a\,d^2+c^3}}}{c^{\frac{1}{4}}\sqrt{c^{\frac{3}{2}}-\sqrt{4a\,d^2+c^3}}}\right)\left(c^3+12a\,d^2+c^{\frac{3}{2}}\sqrt{4a\,d^2+c^3}\right)\sqrt{2}}{64a\,c^{\frac{7}{4}}\left(4a\,d^2+c^3\right)^{\frac{3}{2}}\sqrt{c^{\frac{3}{2}}-\sqrt{4a\,d^2+c^3}}}$$

$$+\frac{d\arctanh\left(\frac{-(dx+c)\sqrt{2}+c^{\frac{1}{4}}\sqrt{c^{\frac{3}{2}}+\sqrt{4a\,d^2+c^3}}}{c^{\frac{1}{4}}\sqrt{c^{\frac{3}{2}}-\sqrt{4a\,d^2+c^3}}}\right)\left(c^3+12a\,d^2+c^{\frac{3}{2}}\sqrt{4a\,d^2+c^3}\right)\sqrt{2}}{64a\,c^{\frac{7}{4}}\left(4a\,d^2+c^3\right)^{\frac{3}{2}}\sqrt{c^{\frac{3}{2}}-\sqrt{4a\,d^2+c^3}}}$$

$$-\frac{d\ln\left(d^2\left(\frac{c}{d}+x\right)^2+\sqrt{c}\,\sqrt{4a\,d^2+c^3}-c^{\frac{1}{4}}d\left(\frac{c}{d}+x\right)\sqrt{2}\,\sqrt{c^{\frac{3}{2}}+\sqrt{4a\,d^2+c^3}}\right)\left(c^3+12a\,d^2-c^{\frac{3}{2}}\sqrt{4a\,d^2+c^3}\right)}{128a\,c^{\frac{7}{4}}\left(4a\,d^2+c^3\right)^{\frac{3}{2}}\sqrt{c^{\frac{3}{2}}+\sqrt{4a\,d^2+c^3}}}$$

$$+\frac{d\ln\left(d^2\left(\frac{c}{d}+x\right)^2+\sqrt{c}\,\sqrt{4a\,d^2+c^3}+c^{\frac{1}{4}}d\left(\frac{c}{d}+x\right)\sqrt{2}\,\sqrt{c^{\frac{3}{2}}+\sqrt{4a\,d^2+c^3}}\right)\left(c^3+12a\,d^2-c^{\frac{3}{2}}\sqrt{4a\,d^2+c^3}\right)}{128a\,c^{\frac{7}{4}}\left(4a\,d^2+c^3\right)^{\frac{3}{2}}\sqrt{c^{\frac{3}{2}}+\sqrt{4a\,d^2+c^3}}}$$

command

```
integrate(1/(d**2*x**4+4*c*d*x**3+4*c**2*x**2+4*a*c)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{4acd+3c^2dx^2+cd^2x^3+x\left(4ad^2+2c^3\right)}{256a^3c^2d^2+64a^2c^5+x^4\left(64a^2cd^4+16ac^4d^2\right)+x^3\left(256a^2c^2d^3+64ac^5d\right)+x^2\left(256a^2c^3d^2+64ac^6\right)}$$

$$+\text{RootSum}\left(t^4\left(1073741824a^9c^7d^6+805306368a^8c^{10}d^4+201326592a^7c^{13}d^2+16777216a^6c^{16}\right)+t^2\left(491520a^5c^5d^4\right.\right.$$

31 Test file number 52

Test folder name:

`test_cases/1_Algebraic_functions/1.3_Miscellaneous/52_1.3.2_Algebraic_functions`

31.1 Problem number 289

$$\int x\sqrt{\frac{1-x^2}{1+x^2}}\,dx$$

Optimal antiderivative

$$-\arctan\left(\sqrt{\frac{-x^2+1}{x^2+1}}\right)+\frac{\left(x^2+1\right)\sqrt{\frac{-x^2+1}{x^2+1}}}{2}$$

command

```
integrate(x*((-x**2+1)/(x**2+1))**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

$$\int x\sqrt{-\frac{(x-1)(x+1)}{x^2+1}}\,dx$$

Sympy 1.8 under Python 3.8.8 output

$$\begin{cases}\frac{\sqrt{1-x^2}\sqrt{x^2+1}}{2}-\operatorname{asin}\left(\frac{\sqrt{2}\sqrt{1-x^2}}{2}\right) & \text{for } x>-1\wedge x<1\end{cases}$$

31.2 Problem number 290

$$\int x\sqrt{\frac{5-7x^2}{7+5x^2}}\,dx$$

Optimal antiderivative

$$-\frac{37\arctan\left(\frac{\sqrt{35}\sqrt{\frac{-7x^2+5}{5x^2+7}}}{7}\right)\sqrt{35}}{175}+\frac{\left(5x^2+7\right)\sqrt{\frac{-7x^2+5}{5x^2+7}}}{10}$$

command

`integrate(x*((-7*x**2+5)/(5*x**2+7))**(1/2),x)`

Sympy 1.10.1 under Python 3.10.4 output

$$\int x\sqrt{-\frac{7x^2-5}{5x^2+7}}\,dx$$

Sympy 1.8 under Python 3.8.8 output

$$\begin{cases} \dfrac{5\sqrt{35}\left(\dfrac{\sqrt{25-35x^2}\sqrt{35x^2+49}}{125}-\dfrac{74\operatorname{asin}\left(\dfrac{\sqrt{74}\sqrt{25-35x^2}}{74}\right)}{125}\right)}{14} & \text{for } x>-\dfrac{\sqrt{35}}{7}\wedge x<\dfrac{\sqrt{35}}{7} \end{cases}$$

31.3 Problem number 573

$$\int \frac{1}{\frac{1}{\sqrt[3]{x}}+\frac{1}{\sqrt[4]{x}}}\,dx$$

Optimal antiderivative

$$\begin{aligned} &12x^{\frac{1}{12}}-6x^{\frac{1}{6}}+4x^{\frac{1}{4}}-3x^{\frac{1}{3}}+\frac{12x^{\frac{5}{12}}}{5}+\frac{12x^{\frac{7}{12}}}{7}-\frac{3x^{\frac{2}{3}}}{2}+\frac{4x^{\frac{3}{4}}}{3}-\frac{6x^{\frac{5}{6}}}{5}\\ &+\frac{12x^{\frac{11}{12}}}{11}-x+\frac{12x^{\frac{13}{12}}}{13}-\frac{6x^{\frac{7}{6}}}{7}+\frac{4x^{\frac{5}{4}}}{5}-12\ln\left(1+x^{\frac{1}{12}}\right)-2\sqrt{x} \end{aligned}$$

command

`integrate(1/(1/x**(1/3)+1/x**(1/4)),x)`

Sympy 1.10.1 under Python 3.10.4 output

$$\int \frac{x^{\frac{7}{12}}}{\sqrt[4]{x}+\sqrt[3]{x}}\,dx$$

Sympy 1.8 under Python 3.8.8 output

$$\begin{aligned} &\frac{12x^{\frac{13}{12}}}{13}+\frac{12x^{\frac{11}{12}}}{11}+\frac{12x^{\frac{7}{12}}}{7}+\frac{12x^{\frac{5}{12}}}{5}+12\sqrt[12]{x}-\frac{6x^{\frac{7}{6}}}{7}-\frac{6x^{\frac{5}{6}}}{5}-6\sqrt[6]{x}\\ &+\frac{4x^{\frac{5}{4}}}{5}+\frac{4x^{\frac{3}{4}}}{3}+4\sqrt[4]{x}-\frac{3x^{\frac{2}{3}}}{2}-3\sqrt[3]{x}-2\sqrt{x}-x-12\log\left(\sqrt[12]{x}+1\right) \end{aligned}$$

31.4 Problem number 577

$$\int \frac{\sqrt{x}}{\sqrt[3]{x}+x}\,dx$$

Optimal antiderivative

$$-\frac{3\arctan\left(-1+x^{\frac{1}{6}}\sqrt{2}\right)\sqrt{2}}{2}-\frac{3\arctan\left(1+x^{\frac{1}{6}}\sqrt{2}\right)\sqrt{2}}{2}$$
$$-\frac{3\ln\left(1+x^{\frac{1}{3}}-x^{\frac{1}{6}}\sqrt{2}\right)\sqrt{2}}{4}+\frac{3\ln\left(1+x^{\frac{1}{3}}+x^{\frac{1}{6}}\sqrt{2}\right)\sqrt{2}}{4}+2\sqrt{x}$$

command

```
integrate(x**(1/2)/(x**(1/3)+x),x)
```

Sympy 1.10.1 under Python 3.10.4 output

$$\int \frac{\sqrt{x}}{\sqrt[3]{x}+x}\,dx$$

Sympy 1.8 under Python 3.8.8 output

$$2\sqrt{x}-\frac{3\sqrt{2}\,\log\left(-4\sqrt{2}\,\sqrt[6]{x}+4\sqrt[3]{x}+4\right)}{4}+\frac{3\sqrt{2}\,\log\left(4\sqrt{2}\,\sqrt[6]{x}+4\sqrt[3]{x}+4\right)}{4}$$
$$-\frac{3\sqrt{2}\,\operatorname{atan}\left(\sqrt{2}\,\sqrt[6]{x}-1\right)}{2}-\frac{3\sqrt{2}\,\operatorname{atan}\left(\sqrt{2}\,\sqrt[6]{x}+1\right)}{2}$$

31.5 Problem number 580

$$\int \frac{\sqrt{x}}{-\frac{1}{\sqrt[3]{x}}+\sqrt{x}}\,dx$$

Optimal antiderivative

$$6x^{\frac{1}{6}}+x+\frac{6\ln\left(1-x^{\frac{1}{6}}\right)}{5}-\frac{3\ln\left(2+x^{\frac{1}{6}}+2x^{\frac{1}{3}}-x^{\frac{1}{6}}\sqrt{5}\right)\left(-\sqrt{5}+1\right)}{10}$$
$$-\frac{3\ln\left(2+x^{\frac{1}{6}}+2x^{\frac{1}{3}}+x^{\frac{1}{6}}\sqrt{5}\right)\left(\sqrt{5}+1\right)}{10}$$
$$-\frac{3\arctan\left(\frac{\left(1+4x^{\frac{1}{6}}+\sqrt{5}\right)\sqrt{50+10\sqrt{5}}}{20}\right)\sqrt{10-2\sqrt{5}}}{5}$$
$$-\frac{3\arctan\left(\frac{1+4x^{\frac{1}{6}}-\sqrt{5}}{\sqrt{10+2\sqrt{5}}}\right)\sqrt{10+2\sqrt{5}}}{5}$$

command

```
integrate(x**(1/2)/(-1/x**(1/3)+x**(1/2)),x)
```

Sympy 1.10.1 under Python 3.10.4 output

$$\int \frac{x^{\frac{5}{6}}}{\left(\sqrt[6]{x}-1\right)\left(\sqrt[6]{x}+x^{\frac{2}{3}}+\sqrt[3]{x}+\sqrt{x}+1\right)}\,dx$$

Sympy 1.8 under Python 3.8.8 output

$$\begin{aligned}
&6\sqrt[6]{x}+x+\frac{6\log\left(\sqrt[6]{x}-1\right)}{5}-\frac{3\sqrt{5}\,\log\left(8\sqrt[6]{x}+8\sqrt{5}\,\sqrt[6]{x}+16\sqrt[3]{x}+16\right)}{10}\\
&-\frac{3\log\left(8\sqrt[6]{x}+8\sqrt{5}\,\sqrt[6]{x}+16\sqrt[3]{x}+16\right)}{10}-\frac{3\log\left(-8\sqrt{5}\,\sqrt[6]{x}+8\sqrt[6]{x}+16\sqrt[3]{x}+16\right)}{10}\\
&+\frac{3\sqrt{5}\,\log\left(-8\sqrt{5}\,\sqrt[6]{x}+8\sqrt[6]{x}+16\sqrt[3]{x}+16\right)}{10}\\
&-\frac{3\sqrt{2}\,\sqrt{5-\sqrt{5}}\,\operatorname{atan}\left(\frac{2\sqrt{2}\,\sqrt[6]{x}}{\sqrt{5-\sqrt{5}}}+\frac{\sqrt{2}}{2\sqrt{5-\sqrt{5}}}+\frac{\sqrt{10}}{2\sqrt{5-\sqrt{5}}}\right)}{5}\\
&-\frac{3\sqrt{2}\,\sqrt{\sqrt{5}+5}\,\operatorname{atan}\left(\frac{2\sqrt{2}\,\sqrt[6]{x}}{\sqrt{\sqrt{5}+5}}-\frac{\sqrt{10}}{2\sqrt{\sqrt{5}+5}}+\frac{\sqrt{2}}{2\sqrt{\sqrt{5}+5}}\right)}{5}
\end{aligned}$$

31.6 Problem number 915

$$\int \frac{-4+x}{\left(1+\sqrt[3]{x}\right)\sqrt{x}}\,dx$$

Optimal antiderivative

$$-30x^{\frac{1}{6}}-\frac{6x^{\frac{5}{6}}}{5}+\frac{6x^{\frac{7}{6}}}{7}+30\arctan\left(x^{\frac{1}{6}}\right)+2\sqrt{x}$$

command

```
integrate((-4+x)/(1+x**(1/3))/x**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

$$\int \frac{x-4}{\sqrt{x}\,\left(\sqrt[3]{x}+1\right)}\,dx$$

Sympy 1.8 under Python 3.8.8 output

$$\frac{6x^{\frac{7}{6}}}{7}-\frac{6x^{\frac{5}{6}}}{5}-30\sqrt[6]{x}+2\sqrt{x}+30\operatorname{atan}\left(\sqrt[6]{x}\right)$$

32 Test file number 57

Test folder name:

`test_cases/3_Logarithms/57_3.1.4-f_x-^m-d+e_x^r-^q-a+b_log-c_x^n-^p`

32.1 Problem number 120

$$\int \frac{x \log^2(x)}{(d+ex)^4}\,dx$$

Optimal antiderivative

$$-\frac{x}{3d^2e\,(ex+d)} + \frac{x\ln(x)}{3de\,(ex+d)^2} + \frac{x^2(ex+3d)\ln(x)^2}{6d^2\,(ex+d)^3} - \frac{\ln(x)\ln\left(1+\frac{ex}{d}\right)}{3d^2e^2} - \frac{\operatorname{polylog}\left(2,-\frac{ex}{d}\right)}{3d^2e^2}$$

command

```
integrate(x*ln(x)**2/(e*x+d)**4,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{(-d-3ex)\log(x)^2}{6d^3e^2+18d^2e^3x+18de^4x^2+6e^5x^3}+\frac{\left(\begin{cases}\frac{x}{d^3} & \text{for } e=0\\ -\frac{1}{2e(d+ex)^2} & \text{otherwise}\end{cases}\right)\log(x)}{e}$$
$$-\frac{\begin{cases}\frac{x}{d^3} & \text{for } e=0\\ -\frac{1}{2d^2e+2de^2x}-\frac{\log(x)}{2d^2e}+\frac{\log\left(\frac{d}{e}+x\right)}{2d^2e} & \text{otherwise}\end{cases}}{e}$$
$$+\frac{\begin{cases}-\frac{1}{e^3x} & \text{for } d=0\\ -\frac{1}{2de^2+2e^3x}-\frac{\log(d+ex)}{2de^2} & \text{otherwise}\end{cases}}{3d}-\frac{\left(\begin{cases}\frac{1}{e^3x} & \text{for } d=0\\ -\frac{1}{2d\left(\frac{d}{x}+e\right)^2} & \text{otherwise}\end{cases}\right)\log(x)}{3d}$$
$$-\frac{2\left(\begin{cases}-\frac{1}{e^2x} & \text{for } d=0\\ -\frac{\log(d^2+dex)}{de} & \text{otherwise}\end{cases}\right)}{3de}+\frac{2\left(\begin{cases}\frac{1}{e^2x} & \text{for } d=0\\ -\frac{1}{\frac{d^2}{x}+de} & \text{otherwise}\end{cases}\right)\log(x)}{3de}$$
$$+\frac{\begin{cases}-\frac{1}{ex} & \text{for } d=0\\ \begin{cases}\log(e)\log(x)+\operatorname{Li}_2\left(\frac{de^{i\pi}}{ex}\right) & \text{for } |x|<1\\ -\log(e)\log\left(\frac{1}{x}\right)+\operatorname{Li}_2\left(\frac{de^{i\pi}}{ex}\right) & \text{for } \frac{1}{|x|}<1\\ -G_{2,2}^{2,0}\left(\begin{matrix}1,1\\0,0\end{matrix}\middle|x\right)\log(e)+G_{2,2}^{0,2}\left(\begin{matrix}1,1\\0,0\end{matrix}\middle|x\right)\log(e)+\operatorname{Li}_2\left(\frac{de^{i\pi}}{ex}\right) & \text{otherwise}\end{cases} & \text{otherwise}\end{cases}}{3de^2}$$
$$-\frac{\left(\begin{cases}\frac{1}{ex} & \text{for } d=0\\ \frac{\log\left(\frac{d}{x}+e\right)}{d} & \text{otherwise}\end{cases}\right)\log(x)}{3de^2}$$

32.2 Problem number 343

$$\int \frac{a+b\log(cx)}{\left(d+\frac{e}{x}\right)x^3}\,dx$$

Optimal antiderivative

$$-\frac{b}{ex}+\frac{-a-b\ln(cx)}{ex}-\frac{d(a+b\ln(cx))^2}{2b\,e^2}+\frac{d(a+b\ln(cx))\ln\left(1+\frac{dx}{e}\right)}{e^2}+\frac{bd\,\mathrm{polylog}\left(2,-\frac{dx}{e}\right)}{e^2}$$

command

```
integrate((a+b*ln(c*x))/(d+e/x)/x**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{ad^2\left(\begin{cases}\frac{x}{e} & \text{for } d = 0\\ \frac{\log\left(dx+e\right)}{d} & \text{otherwise}\end{cases}\right)}{e^2} - \frac{ad\log\left(x\right)}{e^2} - \frac{a}{ex}$$
$$- \frac{bd^2\left(\begin{cases}\frac{x}{e} & \text{for } d = 0\\ \begin{cases}\log\left(e\right)\log\left(x\right) - \operatorname{Li}_2\left(\frac{dxe^{i\pi}}{e}\right) & \text{for } |x| < 1\\ -\log\left(e\right)\log\left(\frac{1}{x}\right) - \operatorname{Li}_2\left(\frac{dxe^{i\pi}}{e}\right) & \text{for } \frac{1}{|x|} < 1\\ -G_{2,2}^{2,0}\left(\begin{matrix}& 1,1\\ 0,0 & \end{matrix}\middle| x\right)\log\left(e\right) + G_{2,2}^{0,2}\left(\begin{matrix}1,1 & \\ & 0,0\end{matrix}\middle| x\right)\log\left(e\right) - \operatorname{Li}_2\left(\frac{dxe^{i\pi}}{e}\right) & \text{otherwise}\end{cases} & \text{otherwise}\end{cases}\right)}{e^2}$$
$$+ \frac{bd^2\left(\begin{cases}\frac{x}{e} & \text{for } d = 0\\ \frac{\log\left(dx+e\right)}{d} & \text{otherwise}\end{cases}\right)\log\left(cx\right)}{e^2} + \frac{bd\log\left(x\right)^2}{2e^2} - \frac{bd\log\left(x\right)\log\left(cx\right)}{e^2} - \frac{b\log\left(cx\right)}{ex} - \frac{b}{ex}$$

32.3 Problem number 344

$$\int \frac{a + b\log(cx)}{\left(d + \frac{e}{x}\right)x^4}\,dx$$

Optimal antiderivative

$$-\frac{b}{4e\,x^2} + \frac{bd}{e^2x} + \frac{-a - b\ln(cx)}{2e\,x^2} + \frac{d(a + b\ln(cx))}{e^2x} + \frac{d^2(a + b\ln(cx))^2}{2b\,e^3}$$
$$-\frac{d^2(a + b\ln(cx))\ln\left(1 + \frac{dx}{e}\right)}{e^3} - \frac{b\,d^2\,\mathrm{polylog}\left(2, -\frac{dx}{e}\right)}{e^3}$$

command

```
integrate((a+b*ln(c*x))/(d+e/x)/x**4,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{ad^3\left(\begin{cases}\frac{x}{e} & \text{for } d=0\\ \frac{\log(dx+e)}{d} & \text{otherwise}\end{cases}\right)}{e^3}+\frac{ad^2\log(x)}{e^3}+\frac{ad}{e^2x}-\frac{a}{2ex^2}$$

$$+\frac{bd^3\left(\begin{cases}\frac{x}{e} & \text{for } d=0\\ \begin{cases}\log(e)\log(x)-\operatorname{Li}_2\left(\frac{dxe^{i\pi}}{e}\right) & \text{for } |x|<1\\ -\log(e)\log\left(\frac{1}{x}\right)-\operatorname{Li}_2\left(\frac{dxe^{i\pi}}{e}\right) & \text{for } \frac{1}{|x|}<1\\ -G_{2,2}^{2,0}\left(\begin{matrix}1,1\\0,0\end{matrix}\middle|x\right)\log(e)+G_{2,2}^{0,2}\left(\begin{matrix}1,1\\0,0\end{matrix}\middle|x\right)\log(e)-\operatorname{Li}_2\left(\frac{dxe^{i\pi}}{e}\right) & \text{otherwise}\end{cases} & \text{otherwise}\end{cases}\right)}{e^3}$$

$$-\frac{bd^3\left(\begin{cases}\frac{x}{e} & \text{for } d=0\\ \frac{\log(dx+e)}{d} & \text{otherwise}\end{cases}\right)\log(cx)}{e^3}-\frac{bd^2\log(x)^2}{2e^3}$$

$$+\frac{bd^2\log(x)\log(cx)}{e^3}+\frac{bd\log(cx)}{e^2x}+\frac{bd}{e^2x}-\frac{b\log(cx)}{2ex^2}-\frac{b}{4ex^2}$$

33 Test file number 59

Test folder name:

`test_cases/3_Logarithms/59_3.2.1-f+g_x-^m-A+B_log-e-a+b_x-over-c+d_x-^n-^p`

33.1 Problem number 3

$$\int (ag+bgx)^2\left(A+B\log\left(e\left(\frac{a+bx}{c+dx}\right)^n\right)\right)dx$$

Optimal antiderivative

$$\frac{B(-ad+bc)^2g^2nx}{3d^2}-\frac{B(-ad+bc)g^2n(bx+a)^2}{6bd}$$
$$+\frac{g^2(bx+a)^3\left(A+B\ln\left(e\left(\frac{bx+a}{dx+c}\right)^n\right)\right)}{3b}-\frac{B(-ad+bc)^3g^2n\ln(dx+c)}{3bd^3}$$

command

```
integrate((b*g*x+a*g)**2*(A+B*ln(e*((b*x+a)/(d*x+c))**n)),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\begin{cases} a^2g^2x\left(A+B\log\left(e\left(\frac{a}{c}\right)^n\right)\right) \\ Aa^2g^2x+Aabg^2x^2+\frac{Ab^2g^2x^3}{3}+\frac{Ba^3g^2n\log\left(\frac{a}{c}+\frac{bx}{c}\right)}{3b}+Ba^2g^2nx\log\left(\frac{a}{c}+\frac{bx}{c}\right)-\frac{Ba^2g^2nx}{3}+Ba^2g^2x\log(e)+Babg^2n \\ a^2g^2\left(Ax-\frac{Bcn\log(c+dx)}{d}+Bnx\log(a)-Bnx\log(c+dx)+Bnx+Bx\log(e)\right) \\ Aa^2g^2x+Aabg^2x^2+\frac{Ab^2g^2x^3}{3}+\frac{Ba^3g^2n\log\left(\frac{a}{c+dx}+\frac{bx}{c+dx}\right)}{3b}+\frac{Ba^3g^2n\log\left(\frac{c}{d}+x\right)}{3b}-\frac{Ba^2cg^2n\log\left(\frac{c}{d}+x\right)}{d}+Ba^2g^2nx\log\left(\frac{a}{c+dx} \end{cases}$$

33.2 Problem number 31

$$\int (cg+dgx)^2\left(A+B\log\left(e\left(\frac{a+bx}{c+dx}\right)^n\right)\right)\,dx$$

Optimal antiderivative

$$-\frac{B(-ad+bc)^2g^2nx}{3b^2}-\frac{B(-ad+bc)g^2n(dx+c)^2}{6bd} \\ -\frac{B(-ad+bc)^3g^2n\ln(bx+a)}{3b^3d}+\frac{g^2(dx+c)^3\left(A+B\ln\left(e\left(\frac{bx+a}{dx+c}\right)^n\right)\right)}{3d}$$

command

```
integrate((d*g*x+c*g)**2*(A+B*ln(e*((b*x+a)/(d*x+c))**n)),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\begin{cases} c^2g^2x\left(A+B\log\left(e\left(\frac{a}{c}\right)^n\right)\right) \\ Ac^2g^2x+Acdg^2x^2+\frac{Ad^2g^2x^3}{3}-\frac{Bc^3g^2n\log(c+dx)}{3d}+Bc^2g^2nx\log(a)-Bc^2g^2nx\log(c+dx)+\frac{Bc^2g^2nx}{3}+Bc^2g^2x\lo \\ c^2g^2\left(Ax+\frac{Ban\log\left(\frac{a}{c}+\frac{bx}{c}\right)}{b}+Bnx\log\left(\frac{a}{c}+\frac{bx}{c}\right)-Bnx+Bx\log(e)\right) \\ Ac^2g^2x+Acdg^2x^2+\frac{Ad^2g^2x^3}{3}+\frac{Ba^3d^2g^2n\log\left(\frac{a}{c+dx}+\frac{bx}{c+dx}\right)}{3b^3}+\frac{Ba^3d^2g^2n\log\left(\frac{c}{d}+x\right)}{3b^3}-\frac{Ba^2cdg^2n\log\left(\frac{a}{c+dx}+\frac{bx}{c+dx}\right)}{b^2}-\frac{Ba^2cdg^2n}{b} \end{cases}$$

33.3 Problem number 59

$$\int (f+gx)^2 \left(A+B\log\left(e\left(\frac{a+bx}{c+dx}\right)^n\right)\right)\,dx$$

Optimal antiderivative

$$-\frac{B(-ad+bc)\,g(-adg-bcg+3bdf)\,nx}{3b^2d^2}-\frac{B(-ad+bc)\,g^2nx^2}{6bd}-\frac{B(-ag+bf)^3\,n\ln(bx+a)}{3b^3g}$$
$$+\frac{(gx+f)^3\left(A+B\ln\left(e\left(\frac{bx+a}{dx+c}\right)^n\right)\right)}{3g}+\frac{B(-cg+df)^3\,n\ln(dx+c)}{3d^3g}$$

command

```
integrate((g*x+f)**2*(A+B*ln(e*((b*x+a)/(d*x+c))**n)),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

output too large to display

34 Test file number 60

Test folder name:

```
test_cases/3_Logarithms/60_3.2.2-f+g_x-^m-h+i_x-^q-A+B_log-e-a+b_x-over-c+d_x-^n-^p
```

34.1 Problem number 45

$$\int \frac{A+B\log\left(\frac{e(a+bx)}{c+dx}\right)}{(ag+bgx)^3(ci+dix)^2}\,dx$$

Optimal antiderivative

$$\frac{B\,d^3(bx+a)}{(-ad+bc)^4\,g^3i^2\,(dx+c)}+\frac{3b^2Bd(dx+c)}{(-ad+bc)^4\,g^3i^2\,(bx+a)}$$
$$-\frac{b^3B(dx+c)^2}{4\,(-ad+bc)^4\,g^3i^2\,(bx+a)^2}-\frac{3bB\,d^2\ln\left(\frac{bx+a}{dx+c}\right)^2}{2\,(-ad+bc)^4\,g^3i^2}$$
$$-\frac{d^3(bx+a)\left(A+B\ln\left(\frac{e(bx+a)}{dx+c}\right)\right)}{(-ad+bc)^4\,g^3i^2\,(dx+c)}+\frac{3b^2d(dx+c)\left(A+B\ln\left(\frac{e(bx+a)}{dx+c}\right)\right)}{(-ad+bc)^4\,g^3i^2\,(bx+a)}$$
$$-\frac{b^3(dx+c)^2\left(A+B\ln\left(\frac{e(bx+a)}{dx+c}\right)\right)}{2\,(-ad+bc)^4\,g^3i^2\,(bx+a)^2}+\frac{3b\,d^2\ln\left(\frac{bx+a}{dx+c}\right)\left(A+B\ln\left(\frac{e(bx+a)}{dx+c}\right)\right)}{(-ad+bc)^4\,g^3i^2}$$

command

```
integrate((A+B*ln(e*(b*x+a)/(d*x+c)))/(b*g*x+a*g)**3/(d*i*x+c*i)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

output too large to display

34.2 Problem number 52

$$\int \frac{A + B \log\left(\frac{e(a+bx)}{c+dx}\right)}{(ag+bgx)^2(ci+dix)^3}\,dx$$

Optimal antiderivative

$$\frac{B\,d^3(bx+a)^2}{4\left(-ad+bc\right)^4 g^2 i^3\left(dx+c\right)^2} - \frac{3bB\,d^2(bx+a)}{\left(-ad+bc\right)^4 g^2 i^3\left(dx+c\right)} - \frac{b^3 B(dx+c)}{\left(-ad+bc\right)^4 g^2 i^3\left(bx+a\right)} + \frac{3b^2 Bd\ln\left(\frac{bx+a}{dx+c}\right)^2}{2\left(-ad+bc\right)^4 g^2 i^3} - \frac{d^3(bx+a)^2\left(A+B\ln\left(\frac{e(bx+a)}{dx+c}\right)\right)}{2\left(-ad+bc\right)^4 g^2 i^3\left(dx+c\right)^2} + \frac{3b\,d^2(bx+a)\left(A+B\ln\left(\frac{e(bx+a)}{dx+c}\right)\right)}{\left(-ad+bc\right)^4 g^2 i^3\left(dx+c\right)} - \frac{b^3(dx+c)\left(A+B\ln\left(\frac{e(bx+a)}{dx+c}\right)\right)}{\left(-ad+bc\right)^4 g^2 i^3\left(bx+a\right)} - \frac{3b^2 d\ln\left(\frac{bx+a}{dx+c}\right)\left(A+B\ln\left(\frac{e(bx+a)}{dx+c}\right)\right)}{\left(-ad+bc\right)^4 g^2 i^3}$$

command

```
integrate((A+B*ln(e*(b*x+a)/(d*x+c)))/(b*g*x+a*g)**2/(d*i*x+c*i)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

output too large to display

34.3 Problem number 106

$$\int \frac{\left(A+B\log\left(\frac{e(a+bx)}{c+dx}\right)\right)^2}{(ag+bgx)^3(ci+dix)^3}\,dx$$

Optimal antiderivative

$$\frac{B^2d^4(bx+a)^2}{4\left(-ad+bc\right)^5g^3i^3\left(dx+c\right)^2}+\frac{8AbB\,d^3(bx+a)}{\left(-ad+bc\right)^5g^3i^3\left(dx+c\right)}-\frac{8b\,B^2d^3(bx+a)}{\left(-ad+bc\right)^5g^3i^3\left(dx+c\right)}$$
$$+\frac{8b^3B^2d(dx+c)}{\left(-ad+bc\right)^5g^3i^3\left(bx+a\right)}-\frac{b^4B^2(dx+c)^2}{4\left(-ad+bc\right)^5g^3i^3\left(bx+a\right)^2}+\frac{8b\,B^2d^3(bx+a)\ln\left(\frac{e(bx+a)}{dx+c}\right)}{\left(-ad+bc\right)^5g^3i^3\left(dx+c\right)}$$
$$-\frac{B\,d^4(bx+a)^2\left(A+B\ln\left(\frac{e(bx+a)}{dx+c}\right)\right)}{2\left(-ad+bc\right)^5g^3i^3\left(dx+c\right)^2}+\frac{8b^3Bd(dx+c)\left(A+B\ln\left(\frac{e(bx+a)}{dx+c}\right)\right)}{\left(-ad+bc\right)^5g^3i^3\left(bx+a\right)}$$
$$-\frac{b^4B(dx+c)^2\left(A+B\ln\left(\frac{e(bx+a)}{dx+c}\right)\right)}{2\left(-ad+bc\right)^5g^3i^3\left(bx+a\right)^2}+\frac{d^4(bx+a)^2\left(A+B\ln\left(\frac{e(bx+a)}{dx+c}\right)\right)^2}{2\left(-ad+bc\right)^5g^3i^3\left(dx+c\right)^2}$$
$$-\frac{4b\,d^3(bx+a)\left(A+B\ln\left(\frac{e(bx+a)}{dx+c}\right)\right)^2}{\left(-ad+bc\right)^5g^3i^3\left(dx+c\right)}+\frac{4b^3d(dx+c)\left(A+B\ln\left(\frac{e(bx+a)}{dx+c}\right)\right)^2}{\left(-ad+bc\right)^5g^3i^3\left(bx+a\right)}$$
$$-\frac{b^4(dx+c)^2\left(A+B\ln\left(\frac{e(bx+a)}{dx+c}\right)\right)^2}{2\left(-ad+bc\right)^5g^3i^3\left(bx+a\right)^2}+\frac{2b^2d^2\left(A+B\ln\left(\frac{e(bx+a)}{dx+c}\right)\right)^3}{B\left(-ad+bc\right)^5g^3i^3}$$

command

```
integrate((A+B*ln(e*(b*x+a)/(d*x+c)))**2/(b*g*x+a*g)**3/(d*i*x+c*i)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

output too large to display

34.4 Problem number 110

$$\int (ag+bgx)(ci+dix)\left(A+B\log\left(e\left(\frac{a+bx}{c+dx}\right)^n\right)\right)\,dx$$

Optimal antiderivative

$$-\frac{B(-ad+bc)^2\,ginx}{6bd}+\frac{gi(bx+a)^2\,(dx+c)\left(A+B\ln\left(e\left(\frac{bx+a}{dx+c}\right)^n\right)\right)}{3b}$$
$$+\frac{(-ad+bc)\,gi(bx+a)^2\left(A-Bn+B\ln\left(e\left(\frac{bx+a}{dx+c}\right)^n\right)\right)}{6b^2}+\frac{B(-ad+bc)^3\,gin\ln(dx+c)}{6b^2d^2}$$

command

```
integrate((b*g*x+a*g)*(d*i*x+c*i)*(A+B*ln(e*((b*x+a)/(d*x+c))**n)),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\begin{cases} acgix\left(A+B\log\left(e\left(\frac{a}{c}\right)^n\right)\right) \\ ag\Big(Acix+\frac{Adix^2}{2}-\frac{Bc^2in\log(c+dx)}{2d}+Bcinx\log(a)-Bcinx\log(c+dx)+\frac{Bcinx}{2}+Bcix\log(e)+\frac{Bdinx^2\log(a)}{2}- \\ ci\Bigg(Aagx+\frac{Abgx^2}{2}+\frac{Ba^2gn\log\left(\frac{a}{c}+\frac{bx}{c}\right)}{2b}+Bagnx\log\left(\frac{a}{c}+\frac{bx}{c}\right)-\frac{Bagnx}{2}+Bagx\log(e)+\frac{Bbgnx^2\log\left(\frac{a}{c}+\frac{bx}{c}\right)}{2}-\frac{Bbgnx^2}{4} \\ Aacgix+\frac{Aadgix^2}{2}+\frac{Abcgix^2}{2}+\frac{Abdgix^3}{3}-\frac{Ba^3dgin\log\left(\frac{a}{c+dx}+\frac{bx}{c+dx}\right)}{6b^2}-\frac{Ba^3dgin\log\left(\frac{c}{d}+x\right)}{6b^2}+\frac{Ba^2cgin\log\left(\frac{a}{c+dx}+\frac{bx}{c+dx}\right)}{2b}+\frac{Ba^2}{} \end{cases}$$

34.5 Problem number 120

$$\int (ci+dix)^2\left(A+B\log\left(e\left(\frac{a+bx}{c+dx}\right)^n\right)\right)\,dx$$

Optimal antiderivative

$$-\frac{B(-ad+bc)^2\,i^2nx}{3b^2}-\frac{B(-ad+bc)\,i^2n(dx+c)^2}{6bd}$$
$$-\frac{B(-ad+bc)^3\,i^2n\ln(bx+a)}{3b^3d}+\frac{i^2(dx+c)^3\left(A+B\ln\left(e\left(\frac{bx+a}{dx+c}\right)^n\right)\right)}{3d}$$

command

`integrate((d*i*x+c*i)**2*(A+B*ln(e*((b*x+a)/(d*x+c))**n)),x)`

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\begin{cases} c^2 i^2 x \left(A + B \log\left(e \left(\frac{a}{c}\right)^{n}\right)\right) \\ Ac^2 i^2 x + Acdi^2 x^2 + \frac{Ad^2 i^2 x^3}{3} - \frac{Bc^3 i^2 n \log(c+dx)}{3d} + Bc^2 i^2 nx \log(a) - Bc^2 i^2 nx \log(c+dx) + \frac{Bc^2 i^2 nx}{3} + Bc^2 i^2 x \log(\\ c^2 i^2 \left(Ax + \frac{Ban \log\left(\frac{a}{c} + \frac{bx}{c}\right)}{b} + Bnx \log\left(\frac{a}{c} + \frac{bx}{c}\right) - Bnx + Bx \log(e)\right) \\ Ac^2 i^2 x + Acdi^2 x^2 + \frac{Ad^2 i^2 x^3}{3} + \frac{Ba^3 d^2 i^2 n \log\left(\frac{a}{c+dx} + \frac{bx}{c+dx}\right)}{3b^3} + \frac{Ba^3 d^2 i^2 n \log\left(\frac{c}{d} + x\right)}{3b^3} - \frac{Ba^2 cdi^2 n \log\left(\frac{a}{c+dx} + \frac{bx}{c+dx}\right)}{b^2} - \frac{Ba^2 cdi^2 n \log}{b^2} \end{cases}$$

34.6 Problem number 245

$$\int \frac{1}{(a+bx)(c+dx)\log\left(e\left(\frac{a+bx}{c+dx}\right)^{n}\right)}\,dx$$

Optimal antiderivative

$$\frac{\ln\left(\ln\left(e\left(\frac{bx+a}{dx+c}\right)^{n}\right)\right)}{(-ad+bc)\,n}$$

command

`integrate(1/(b*x+a)/(d*x+c)/ln(e*((b*x+a)/(d*x+c))**n),x)`

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\begin{cases} -\frac{1}{(bc+bdx)\log(e)} & \text{for } a = \frac{bc}{d} \wedge n = 0 \\ -\frac{1}{bcn \log\left(\frac{bc}{cd+d^2 x} + \frac{bx}{c+dx}\right) + bc \log(e) + bdnx \log\left(\frac{bc}{cd+d^2 x} + \frac{bx}{c+dx}\right) + bdx \log(e)} & \text{for } a = \frac{bc}{d} \\ \frac{-\frac{\log\left(\frac{a}{b}+x\right)}{ad-bc} + \frac{\log\left(\frac{c}{d}+x\right)}{ad-bc}}{\log(e)} & \text{for } n = 0 \\ -\frac{\log\left(n \log\left(\frac{a}{c+dx} + \frac{bx}{c+dx}\right) + \log(e)\right)}{adn-bcn} & \text{otherwise} \end{cases}$$

35 Test file number 61

Test folder name:

`test_cases/3_Logarithms/61_3.2.3_u_log-e-f-a+b_x-^p-c+d_x-^q-^r-^s`

35.1 Problem number 74

$$\int \left(\frac{1}{(c+dx)(-a+c+(-b+d)x)\log\left(\frac{a+bx}{c+dx}\right)} + \frac{\log\left(1-\frac{a+bx}{c+dx}\right)}{(a+bx)(c+dx)\log^2\left(\frac{a+bx}{c+dx}\right)} \right) dx$$

Optimal antiderivative

$$-\frac{\ln\left(1+\frac{-bx-a}{dx+c}\right)}{(-ad+bc)\ln\left(\frac{bx+a}{dx+c}\right)}$$

command

```
integrate(1/(d*x+c)/(-a+c+(-b+d)*x)/ln((b*x+a)/(d*x+c))+ln(1+(-b*x-a)/(d*x+c))/(b*x+a)/(d*x+c
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{\log\left(\frac{-a-bx}{c+dx}+1\right)}{ad\log\left(\frac{a+bx}{c+dx}\right)-bc\log\left(\frac{a+bx}{c+dx}\right)}$$

35.2 Problem number 75

$$\int \left(-\frac{1}{(a+bx)(a-c+(b-d)x)\log\left(\frac{a+bx}{c+dx}\right)} + \frac{\log\left(1-\frac{c+dx}{a+bx}\right)}{(a+bx)(c+dx)\log^2\left(\frac{a+bx}{c+dx}\right)} \right) dx$$

Optimal antiderivative

$$-\frac{\ln\left(1+\frac{-dx-c}{bx+a}\right)}{(-ad+bc)\ln\left(\frac{bx+a}{dx+c}\right)}$$

command

```
integrate(-1/(b*x+a)/(a-c+(b-d)*x)/ln((b*x+a)/(d*x+c))+ln(1+(-d*x-c)/(b*x+a))/(b*x+a)/(d*x+c)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{\log\left(1+\frac{-c-dx}{a+bx}\right)}{ad\log\left(\frac{a+bx}{c+dx}\right)-bc\log\left(\frac{a+bx}{c+dx}\right)}$$

36 Test file number 64

Test folder name:

`test_cases/3_Logarithms/64_3.5_Logarithm_functions`

36.1 Problem number 26

$$\int \frac{ax+2bn\log\left(cx^n\right)}{ax^2+bx\log^2\left(cx^n\right)}\,dx$$

Optimal antiderivative

$$\ln\left(ax+b\ln(c\,x^n)^2\right)$$

command

```
integrate((a*x+2*b*n*ln(c*x**n))/(a*x**2+b*x*ln(c*x**n)**2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

$$\int \frac{ax+2bn\log\left(cx^n\right)}{x\left(ax+b\log\left(cx^n\right)^2\right)}\,dx$$

Sympy 1.8 under Python 3.8.8 output

$$\begin{cases}\log\left(x+\frac{bn^2\log(x)^2}{a}+\frac{2bn\log(c)\log(x)}{a}+\frac{b\log(c)^2}{a}\right) & \text{for } a\neq 0\\ 2\log\left(n\log(x)+\log(c)\right) & \text{otherwise}\end{cases}$$

37 Test file number 106

Test folder name:

`test_cases/4_Trig_functions/4.3_Tangent/106_4.3.7-d_trig-^m-a+b-c_tan-^n-^p`

37.1 Problem number 216

$$\int \frac{\cot^5(e+fx)}{a+b\tan^2(e+fx)}\,dx$$

Optimal antiderivative

$$\frac{(a+b)\left(\cot^2(fx+e)\right)}{2a^2f} - \frac{\cot^4(fx+e)}{4af} + \frac{\ln(\cos(fx+e))}{(a-b)f} + \frac{\left(a^2+ab+b^2\right)\ln(\tan(fx+e))}{a^3f} + \frac{b^3\ln\left(a+b\left(\tan^2(fx+e)\right)\right)}{2a^3(a-b)f}$$

command

```
integrate(cot(f*x+e)**5/(a+b*tan(f*x+e)**2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

output too large to display

38 Test file number 113

Test folder name:

`test_cases/4_Trig_functions/4.4_Cotangent/113_4.4.7-d_trig-^m-a+b-c_cot-^n-^p`

38.1 Problem number 13

$$\int \frac{1}{\sqrt{-1-\cot^2(x)}}\,dx$$

Optimal antiderivative

$$-\frac{\cot(x)}{\sqrt{-\left(\csc^2(x)\right)}}$$

command

```
integrate(1/(-1-cot(x)**2)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

$$\int \frac{1}{\sqrt{-\cot^2(x)-1}}\,dx$$

Sympy 1.8 under Python 3.8.8 output

$$-\frac{\cot(x)}{\sqrt{-\cot^2(x)-1}}$$

39 Test file number 141

Test folder name:

```
test_cases/4_Trig_functions/4.7_Miscellaneous/141_4.7.7_Trig_functions
```

39.1 Problem number 591

$$\int \frac{x^2}{(ax\cos(ax)-\sin(ax))^2}\,dx$$

Optimal antiderivative

$$-\frac{\cot(ax)}{a^3}+\frac{x\csc(ax)}{a^2\left(ax\cos(ax)-\sin(ax)\right)}$$

command

```
integrate(x**2/(a*x*cos(a*x)-sin(a*x))**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

$$\int \frac{x^2}{\left(ax\cos(ax)-\sin(ax)\right)^2}\,dx$$

Sympy 1.8 under Python 3.8.8 output

$$-\frac{2ax\tan\left(\frac{ax}{2}\right)}{a^4x\tan^2\left(\frac{ax}{2}\right)-a^4x+2a^3\tan\left(\frac{ax}{2}\right)}+\frac{\tan^2\left(\frac{ax}{2}\right)}{a^4x\tan^2\left(\frac{ax}{2}\right)-a^4x+2a^3\tan\left(\frac{ax}{2}\right)}$$
$$-\frac{1}{a^4x\tan^2\left(\frac{ax}{2}\right)-a^4x+2a^3\tan\left(\frac{ax}{2}\right)}$$

40 Test file number 144

Test folder name:

`test_cases/5_Inverse_trig_functions/5.1_Inverse_sine/144_5.1.5_Inverse_sine_functions`

40.1 Problem number 474

$$\int \frac{\sqrt{1-x^2}+x\text{ArcSin}(x)}{\text{ArcSin}(x)-x^2\text{ArcSin}(x)}\,dx$$

Optimal antiderivative

$$-\frac{\ln\left(-x^2+1\right)}{2}+\ln(\arcsin(x))$$

command

```
integrate((x*asin(x)+(-x**2+1)**(1/2))/(asin(x)-x**2*asin(x)),x)
```

Sympy 1.10.1 under Python 3.10.4 output

$$-\int \frac{\sqrt{1-x^2}}{x^2\operatorname{asin}(x)-\operatorname{asin}(x)}\,dx-\int \frac{x\operatorname{asin}(x)}{x^2\operatorname{asin}(x)-\operatorname{asin}(x)}\,dx$$

Sympy 1.8 under Python 3.8.8 output

$$-\frac{\log\left(2x^2-2\right)}{2}+\log\left(\operatorname{asin}(x)\right)$$

41 Test file number 173

Test folder name:

`test_cases/6_Hyperbolic_functions/6.3_Hyperbolic_tangent/173_6.3.7-d_hyper-^m-a+b-c_tanh-^n-^p`

41.1 Problem number 206

$$\int \frac{1}{\sqrt{1-\tanh^2(x)}}\,dx$$

Optimal antiderivative

$$\frac{\tanh(x)}{\sqrt{\operatorname{sech}(x)^2}}$$

command

```
integrate(1/(1-tanh(x)**2)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

$$\int \frac{1}{\sqrt{1-\tanh^2(x)}}\,dx$$

Sympy 1.8 under Python 3.8.8 output

$$\frac{\tanh(x)}{\sqrt{1-\tanh^2(x)}}$$

42 Test file number 196

Test folder name:

```
test_cases/7_Inverse_hyperbolic_functions/7.3_Inverse_hyperbolic_tangent/196_7.3.6_Exponentia
```

42.1 Problem number 201

$$\int \frac{e^{-\tanh^{-1}(ax)}}{c-acx}\,dx$$

Optimal antiderivative

$$\frac{\arcsin(ax)}{ac}$$

command

```
integrate(1/(a*x+1)*(-a**2*x**2+1)**(1/2)/(-a*c*x+c),x)
```

Sympy 1.10.1 under Python 3.10.4 output

$$-\frac{\int \frac{\sqrt{-a^2x^2+1}}{a^2x^2-1}\,dx}{c}$$

Sympy 1.8 under Python 3.8.8 output

$$\frac{\begin{cases} \sqrt{\frac{1}{a^2}}\,\operatorname{asin}\left(x\sqrt{a^2}\right) & \text{for } a^2>0 \\ \sqrt{-\frac{1}{a^2}}\,\operatorname{asinh}\left(x\sqrt{-a^2}\right) & \text{for } a^2<0 \end{cases}}{c}$$

43 Test file number 199

Test folder name:

`test_cases/7_Inverse_hyperbolic_functions/7.4_Inverse_hyperbolic_cotangent/199_7.4.2_Exponent`

43.1 Problem number 256

$$\int e^{-\coth^{-1}(ax)} \sqrt{c-acx}\, dx$$

Optimal antiderivative

$$\frac{8cx\sqrt{1-\frac{1}{a^2x^2}}}{3\sqrt{-acx+c}} + \frac{2x\sqrt{1-\frac{1}{a^2x^2}}\ \sqrt{-acx+c}}{3}$$

command

```
integrate((-a*c*x+c)**(1/2)*((a*x-1)/(a*x+1))**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

$$\int \sqrt{\frac{ax-1}{ax+1}}\ \sqrt{-c\left(ax-1\right)}\, dx$$

Sympy 1.8 under Python 3.8.8 output

$$\frac{4icx\sqrt{\frac{1}{acx+c}}}{3} + \frac{4ic\sqrt{\frac{1}{acx+c}}}{a} - \frac{2i(-acx+c)^2\sqrt{\frac{1}{acx+c}}}{3ac}$$

43.2 Problem number 326

$$\int e^{\coth^{-1}(x)} \sqrt{1-x}\, dx$$

Optimal antiderivative

$$\frac{2(1+x)\sqrt{1-x}}{3\sqrt{\frac{-1+x}{1+x}}}$$

command

```
integrate(1/((-1+x)/(1+x))**(1/2)*(1-x)**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

$$\int \frac{\sqrt{1-x}}{\sqrt{\frac{x-1}{x+1}}}\,dx$$

Sympy 1.8 under Python 3.8.8 output

$$-\frac{2ix}{3\sqrt{\frac{1}{x+1}}}-\frac{2i}{3\sqrt{\frac{1}{x+1}}}$$

43.3 Problem number 338

$$\int e^{-\coth^{-1}(ax)}\sqrt{c-acx}\,dx$$

Optimal antiderivative

$$\frac{8cx\sqrt{1-\frac{1}{a^2x^2}}}{3\sqrt{-acx+c}}+\frac{2x\sqrt{1-\frac{1}{a^2x^2}}\,\sqrt{-acx+c}}{3}$$

command

```
integrate((-a*c*x+c)**(1/2)*((a*x-1)/(a*x+1))**(1/2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

$$\int \sqrt{\frac{ax-1}{ax+1}}\,\sqrt{-c\,(ax-1)}\,dx$$

Sympy 1.8 under Python 3.8.8 output

$$\frac{4icx\sqrt{\frac{1}{acx+c}}}{3}+\frac{4ic\sqrt{\frac{1}{acx+c}}}{a}-\frac{2i(-acx+c)^2\sqrt{\frac{1}{acx+c}}}{3ac}$$

44 Test file number 210

Test folder name:

```
test_cases/210_Hebisch
```

44.1 Problem number 86

$$\int \frac{e^{\frac{18}{2x^2+x^2\log(x)}}\left(-90+4x^2+\left(-36+4x^2\right)\log(x)+x^2\log^2(x)\right)}{4x^2+4x^2\log(x)+x^2\log^2(x)}\,dx$$

Optimal antiderivative

$$x\,\mathrm{e}^{\frac{9}{\ln(x)\left(\frac{x}{2}+\frac{x}{\ln(x)}\right)x}}$$

command

```
integrate((x**2*ln(x)**2+(4*x**2-36)*ln(x)+4*x**2-90)*exp(18/(x**2*ln(x)+2*x**2))/(x**2*ln(x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$xe^{\frac{18}{x^2\log(x)+2x^2}}$$

44.2 Problem number 89

$$\int \frac{e^{14x/5}\left(-360-165x-15x^2\right)+\left(45x+15x^2+e^{14x/5}\left(888x+447x^2+42x^3\right)\right)\log(x)+\left(-360-165x-15x^2+(\right.}{\left(360x+285x^2+70x^3+5x^4\right)\log^2(x)}$$

Optimal antiderivative

$$\frac{3\,\mathrm{e}^{2x}\mathrm{e}^{\frac{4x}{5}}+3\ln(8+x)}{(3+x)\ln(x)}$$

command

```
integrate((((-15*x**2-120*x)*ln(x)-15*x**2-165*x-360)*ln(x+8)+((42*x**3+447*x**2+888*x)*exp(2
15*x**2-165*x-360)*exp(2/5*x)**2*exp(x)**2)/(5*x**4+70*x**3+285*x**2+360*x)/ln(x)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{3e^{\frac{14x}{5}}}{x\log(x)+3\log(x)}+\frac{3\log(x+8)}{x\log(x)+3\log(x)}$$

44.3 Problem number 152

$$\int \frac{e^{\frac{4x^3}{11x-2e^2x-2x^2+2\log(x)}}\left(-8x^2+88x^3-16e^2x^3-8x^4+24x^2\log(x)\right)}{121x^2+4e^4x^2-44x^3+4x^4+e^2\left(-44x^2+8x^3\right)+\left(44x-8e^2x-8x^2\right)\log(x)+4\log^2(x)}\,dx$$

Optimal antiderivative

$$\mathrm{e}^{\frac{2x^2}{\frac{\ln(x)}{x}+\frac{11}{2}-x-\mathrm{e}^2}}-4\,\mathrm{e}^{-2}$$

command

```
integrate((24*x**2*ln(x)-16*x**3*exp(2)-8*x**4+88*x**3-8*x**2)*exp(2*x**3/(2*ln(x)-
2*exp(2)*x-2*x**2+11*x))**2/(4*ln(x)**2+(-8*exp(2)*x-8*x**2+44*x)*ln(x)+4*x**2*exp(2)**2+(8*x
44*x**2)*exp(2)+4*x**4-44*x**3+121*x**2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$e^{\frac{4x^3}{-2x^2-2xe^2+11x+2\log(x)}}$$

44.4 Problem number 222

$$\int \frac{-2x+2\log(x)+(x-\log(x))\log\left(2x^2\right)+(1-x)\log\left(2x^2\right)\log\left(\frac{x}{\log(2x^2)}\right)}{\left(x^3-2x^2\log(x)+x\log^2(x)\right)\log\left(2x^2\right)}\,dx$$

Optimal antiderivative

$$1+\frac{\ln\left(\frac{x}{\ln(2x^2)}\right)}{x-\ln(x)}$$

command

```
integrate(((1-x)*ln(2*x**2)*ln(x/ln(2*x**2))+(x-ln(x))*ln(2*x**2)+2*ln(x)-2*x)/(x*ln(x)**2-
2*x**2*ln(x)+x**3)/ln(2*x**2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{\log\left(\frac{x}{2\log(x)+\log(2)}\right)}{x-\log(x)}$$

44.5 Problem number 255

$$\int \frac{3750x+300x^2+6x^3+\left(4000x^2+300x^3+6x^4\right)\log(x)+\left(\left(4000x^2+310x^3+6x^4\right)\log(x)+\left(3750x+300x^2+\right.\right.}{(2000x+155x^2+3x^3)\log(x)+(1875+}$$

Optimal antiderivative

$$x^2\ln\left(\left(\frac{x}{\frac{3x}{5}+15}+x+\ln(\ln(x))\right)^2\right)$$

command

```
integrate((((6*x**3+300*x**2+3750*x)*ln(x)*ln(ln(x))+(6*x**4+310*x**3+4000*x**2)*ln(x))*ln(((
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\left(x^2-\frac{625}{6}\right)\log\left(\frac{9x^4+480x^3+6400x^2+\left(9x^2+450x+5625\right)\log\left(\log\left(x\right)\right)^2+\left(18x^3+930x^2+12000x\right)\log\left(\log\left(x\right)\right)}{9x^2+450x+5625}\right.$$

$$+\frac{625\log\left(\log\left(\log\left(x\right)\right)+\frac{3x^2+80x}{3x+75}\right)}{3}$$

44.6 Problem number 284

$$\int \frac{e^{\frac{x}{\sqrt{4+2x+2\log\left(x^2\right)}}}\left(-16+8x+20x^2+6x^3+\left(-16+17x+11x^2\right)\log\left(x^2\right)+\left(-4+6x\right)\log^2\left(x^2\right)\right)}{8x^3-8x^4-6x^5+4x^6+2x^7+\left(8x^3-12x^4+4x^6\right)\log\left(x^2\right)+\left(2x^3-4x^4+2x^5\right)\log^2\left(x^2\right)}\,dx$$

Optimal antiderivative

$$\frac{e^{\frac{x}{\sqrt{2\ln\left(x^2\right)+2x+4}}}}{\left(-x^2+x\right)x}$$

command

```
integrate(((6*x-4)*ln(x**2)**2+(11*x**2+17*x-16)*ln(x**2)+6*x**3+20*x**2+8*x-16)*exp(x/(2*ln(
4*x**4+2*x**3)*ln(x**2)**2+(4*x**6-12*x**4+8*x**3)*ln(x**2)+2*x**7+4*x**6-6*x**5-8*x**4+8*x**
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$-\frac{e^{\frac{x}{\sqrt{2x+2\log\left(x^2\right)+4}}}}{x^3-x^2}$$

44.7 Problem number 307

$$\int \frac{e^3\left(-3+5x-x^2\right)+e^6\left(-12+20x-4x^2\right)\log(x)+\left(e^6\left(-12x+4x^2\right)+e^6(12-4x)\log\right.}{30x^2-10x^3+\left(-30x+10x^2\right)\log\left(3x-x^2\right)+\log(x)\left(e^3\left(240x^2-80x^3\right)+e^3\left(-240x+80x^2\right)\log\left(3x-x^2\right)\right)+\log}$$

Optimal antiderivative

$$\frac{\ln(\ln((2-x)\,x+x)-x)}{10\,\mathrm{e}^{-3}+40\ln(x)}$$

command

```
integrate((((-4*x+12)*exp(3)**2*ln(-x**2+3*x)+(4*x**2-12*x)*exp(3)**2)*ln(ln(-x**2+3*x)-
x)+(-4*x**2+20*x-12)*exp(3)**2*ln(x)+(-x**2+5*x-3)*exp(3))/(((160*x**2-480*x)*exp(3)**2*ln(-
x**2+3*x)+(-160*x**3+480*x**2)*exp(3)**2)*ln(x)**2+((80*x**2-240*x)*exp(3)*ln(-x**2+3*x)+(-
80*x**3+240*x**2)*exp(3))*ln(x)+(10*x**2-30*x)*ln(-x**2+3*x)-10*x**3+30*x**2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{e^3\log\left(-x+\log\left(-x^2+3x\right)\right)}{40e^3\log\left(x\right)+10}$$

44.8 Problem number 330

$$\int \frac{e^{\frac{5}{-4x^2+x^2\log(\log(x))}}\left(-5+40\log(x)-10\log(x)\log(\log(x))\right)}{16x^3\log(x)-8x^3\log(x)\log(\log(x))+x^3\log(x)\log^2(\log(x))}\,dx$$

Optimal antiderivative

$$\mathrm{e}^{\frac{5}{x^2(\ln(\ln(x))-4)}}$$

command

```
integrate((-10*ln(x)*ln(ln(x))+40*ln(x)-5)*exp(5/(x**2*ln(ln(x))-4*x**2))/(x**3*ln(x)*ln(ln(x
8*x**3*ln(x)*ln(ln(x))+16*x**3*ln(x)),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$e^{\frac{5}{x^2\log\left(\log\left(x\right)\right)-4x^2}}$$

44.9 Problem number 473

$$\int \frac{4x^3 \log(x) \log^2(\log(x)) + e^{\frac{-8x-5e^3x+x^2-10\log(\log(x))}{\log(\log(x))}} \left(8+5e^3-x+\left(-8-5e^3+2x\right)\log(x)\log(\log(x))\right) + e^{\frac{-8x-5e^3x-}{2\,l}}}{\log(x)\log^2(\log($$

Optimal antiderivative

$$\left(x^2 + \mathrm{e}^{\frac{x\left(\frac{x}{2}-\frac{5e^3}{2}-4\right)}{\ln(\ln(x))}-5}\right)^2 + 3$$

command

```
integrate((((-5*exp(3)+2*x-8)*ln(x)*ln(ln(x))+5*exp(3)+8-x)*exp(1/2*(-10*ln(ln(x))-
5*x*exp(3)+x**2-8*x)/ln(ln(x)))**2+(4*x*ln(x)*ln(ln(x))**2+(-5*x**2*exp(3)+2*x**3-
8*x**2)*ln(x)*ln(ln(x))+5*x**2*exp(3)-x**3+8*x**2)*exp(1/2*(-10*ln(ln(x))-5*x*exp(3)+x**2-
8*x)/ln(ln(x)))+4*x**3*ln(x)*ln(ln(x))**2)/ln(x)/ln(ln(x))**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$x^4 + 2x^2 e^{\frac{\frac{x^2}{2}-\frac{5xe^3}{2}-4x-5\log(\log(x))}{\log(\log(x))}} + e^{\frac{2\left(\frac{x^2}{2}-\frac{5xe^3}{2}-4x-5\log(\log(x))\right)}{\log(\log(x))}}$$

44.10 Problem number 598

$$\int \frac{(12+6x)\log^2\left(\frac{x}{2+x}\right) + e^{\frac{5x}{\log\left(\frac{x}{2+x}\right)}}\left(-20+(20+10x)\log\left(\frac{x}{2+x}\right)\right)}{(2+x)\log^2\left(\frac{x}{2+x}\right)}\,dx$$

Optimal antiderivative

$$2\,\mathrm{e}^{\frac{5x}{\ln\left(\frac{x}{2+x}\right)}} + 6x$$

command

```
integrate((((10*x+20)*ln(x/(2+x))-20)*exp(5*x/ln(x/(2+x)))+(6*x+12)*ln(x/(2+x))**2)/(2+x)/ln(
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$6x + 2e^{\frac{5x}{\log\left(\frac{x}{x+2}\right)}}$$

44.11 Problem number 675

$$\int \frac{\left(4-4x^2\right)\log(5)+\left(-1+x^2\right)\log^2(5)\log(-1+x)+\left(\left(-4+4x^2+e^7\left(-4-4x+8x^2\right)\right)\log(5)+e^7\left(-x-x^2\right)\log\right.}{\left(-16x^2-16x^3+16x^4+16x^5+(8x^2\right.}$$

Optimal antiderivative

$$\frac{\mathrm{e}^7+\ln\left(\frac{\ln(x)}{x}\right)}{\left(x^2+x\right)\left(\ln(-1+x)-\frac{4}{\ln(5)}\right)}$$

command

```
integrate((((-2*x**2+x+1)*ln(5)**2*ln(-1+x)+(-x**2-x)*ln(5)**2+(8*x**2-4*x-4)*ln(5))*ln(x)*ln
2*x**2+x+1)*exp(7)-x**2+1)*ln(5)**2*ln(-1+x)+(-x**2-x)*exp(7)*ln(5)**2+((8*x**2-4*x-
4)*exp(7)+4*x**2-4)*ln(5))*ln(x)+(x**2-1)*ln(5)**2*ln(-1+x)+(-4*x**2+4)*ln(5))/((x**5+x**4-
x**3-x**2)*ln(5)**2*ln(-1+x)**2+(-8*x**5-8*x**4+8*x**3+8*x**2)*ln(5)*ln(-1+x)+16*x**5+16*x**4
16*x**3-16*x**2)/ln(x),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{\log(5)\log\left(\frac{\log(x)}{x}\right)}{x^2\log(5)\log(x-1)-4x^2+x\log(5)\log(x-1)-4x}+\frac{e^7\log(5)}{-4x^2-4x+\left(x^2\log(5)+x\log(5)\right)\log(x-1)}$$

44.12 Problem number 700

$$\int \frac{\left(-8x^2+2x^3-2x^4\right)\log(5)\log\left(\frac{1}{4}\left(-4x+x^2-x^3\right)\right)+\left(16-8x+12x^2+\left(-4x^2+2x^3-3x^4\right)\log(5)\right)\log\left(-4+\right.}{\left(-16x+4x^2-4x^3+\left(4x^3-x^4+x^5\right)\log(5)\right)\log\left(\frac{1}{4}\left(-4\right.\right.}$$

Optimal antiderivative

$$\frac{1-\ln\left(\ln\left(\frac{x\left(-x^2+x\right)}{4}-x\right)\right)}{\ln(x^2\ln(5)-4)}$$

command

```
integrate(((2*x**4-2*x**3+8*x**2)*ln(5)*ln(-1/4*x**3+1/4*x**2-x)*ln(ln(-1/4*x**3+1/4*x**2-
x))+((-3*x**4+2*x**3-4*x**2)*ln(5)+12*x**2-8*x+16)*ln(x**2*ln(5)-4)+(-2*x**4+2*x**3-
8*x**2)*ln(5)*ln(-1/4*x**3+1/4*x**2-x))/((x**5-x**4+4*x**3)*ln(5)-4*x**3+4*x**2-16*x)/ln(-
1/4*x**3+1/4*x**2-x)/ln(x**2*ln(5)-4)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$-\frac{\log\left(\log\left(-\frac{x^3}{4}+\frac{x^2}{4}-x\right)\right)}{\log\left(x^2\log\left(5\right)-4\right)}+\frac{1}{\log\left(x^2\log\left(5\right)-4\right)}$$

44.13 Problem number 778

$$\int \frac{-10+4x+\left(-2+2x-x^2\right)\log(x)+(2-x)\log\left(-\frac{x}{-2+x}\right)}{-2x+x^2+\left(-4x+2x^2\right)\log(x)+\left(-2x+x^2\right)\log^2(x)}\,dx$$

Optimal antiderivative

$$\frac{-4-x+\ln\left(\frac{x}{2-x}\right)}{1+\ln(x)}$$

command

```
integrate(((-x**2+2*x-2)*ln(x)+(2-x)*ln(-x/(-2+x))+4*x-10)/((x**2-2*x)*ln(x)**2+(2*x**2-4*x)*ln(x)+x**2-2*x),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{-x-4}{\log\left(x\right)+1}+\frac{\log\left(-\frac{x}{x-2}\right)}{\log\left(x\right)+1}$$

44.14 Problem number 835

$$\int \frac{4^{\frac{-16-8x-x^2}{-2-2x+2\log\left(\log\left(x^2\right)\right)}}\left(\left(32+48x+18x^2+2x^3\right)\log(4)+\left(2+8x+10x^2+4x^3+\left(-8x-6x^2+3x^3+x^4\right)\log(4)\right)\ln\right.}{\left(2+4x+2x^2\right)\log\left(x^2\right)+(-4-4x)\log}$$

Optimal antiderivative

$$\left(x^2+x\right)\mathrm{e}^{\frac{(4+x)^2\ln(2)}{x+1-\ln\left(\ln\left(x^2\right)\right)}}$$

command

```
integrate(((4*x+2)*ln(x**2)*ln(ln(x**2))**2+(2*(-2*x**3-10*x**2-8*x)*ln(2)-8*x**2-
12*x-4)*ln(x**2)*ln(ln(x**2))+(2*(x**4+3*x**3-6*x**2-8*x)*ln(2)+4*x**3+10*x**2+8*x+2)*ln(x**2
x**2-8*x-16)*ln(2)/(2*ln(ln(x**2))-2*x-2))/(2*ln(x**2)*ln(ln(x**2))**2+(-4*x-4)*ln(x**2)*ln(l
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\left(x^2+x\right) e^{\frac{\left(-2x^2-16x-32\right)\log(2)}{-2x+2\log\left(\log\left(x^2\right)\right)-2}}$$

44.15 Problem number 917

$$\int \frac{-8-2x+\left(7+9x-15x^2-2x^3\right)\log(x)+\left(-x-2x^2\right)\log^2(x)+(1+2x)\log(x)\log(\log(x))}{\left(64x+32x^2+4x^3\right)\log(x)+\left(16x+4x^2\right)\log^2(x)+x\log^3(x)}\,dx$$

Optimal antiderivative

$$\frac{x-\ln(\ln(x))+\ln(x)-x^2}{8+2x+\ln(x)}$$

command

```
integrate(((1+2*x)*ln(x)*ln(ln(x))+(-2*x**2-x)*ln(x)**2+(-2*x**3-15*x**2+9*x+7)*ln(x)-
2*x-8)/(x*ln(x)**3+(4*x**2+16*x)*ln(x)**2+(4*x**3+32*x**2+64*x)*ln(x)),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{-x^2-x-8}{2x+\log(x)+8}-\frac{\log(\log(x))}{2x+\log(x)+8}$$

44.16 Problem number 1003

$$\int \frac{e^4\left(-1+17x-4x^2-12x^3+3x^4\right)+e^4\left(4x-3x^3\right)\log(x)+\left(e^4\left(20-5x-12x^2+3x^3\right)+e^4\left(5-3x^2\right)\log(x)\right)\log}{4x-x^2+x\log(x)+}$$

Optimal antiderivative

$$\left(\left(5-x^2-\ln(\ln(-\ln(x)+x-4)+x)\right)x+9\right)\mathrm{e}^4$$

command

```
integrate((((-exp(4)*ln(x)+(x-4)*exp(4))*ln(-ln(x)+x-4)-x*exp(4)*ln(x)+(x**2-4*x)*exp(4))*ln(
ln(x)+x-4)+x)+((-3*x**2+5)*exp(4)*ln(x)+(3*x**3-12*x**2-5*x+20)*exp(4))*ln(-ln(x)+x-
4)+(-3*x**3+4*x)*exp(4)*ln(x)+(3*x**4-12*x**3-4*x**2+17*x-1)*exp(4))/((ln(x)-x+4)*ln(-
ln(x)+x-4)+x*ln(x)-x**2+4*x),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$-x^3e^4-xe^4\log\left(x+\log\left(x-\log\left(x\right)-4\right)\right)+5xe^4$$

44.17 Problem number 1043

$$\int e^{x+e^{90+10e^2}x+2e^{45+5e^2}x\log\left(e^{-x}x\right)+x\log^2\left(e^{-x}x\right)}\left(1+e^{90+10e^2}\right.$$
$$\left.+e^{45+5e^2}(2-2x)+\left(2+2e^{45+5e^2}-2x\right)\log\left(e^{-x}x\right)+\log^2\left(e^{-x}x\right)\right)\,dx$$

Optimal antiderivative

$$\mathrm{e}^{x\left(\ln\left(x\,\mathrm{e}^{-x}\right)+\mathrm{e}^{5\,\mathrm{e}^2+45}\right)^2+x}$$

command

```
integrate((ln(x/exp(x))**2+(2*exp(5*exp(1)**2+45)-2*x+2)*ln(x/exp(x))+exp(5*exp(1)**2+45)**2+
2*x)*exp(5*exp(1)**2+45)+1)*exp(x*ln(x/exp(x))**2+2*x*exp(5*exp(1)**2+45)*ln(x/exp(x))+x*exp(
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: SystemError

Sympy 1.8 under Python 3.8.8 output

$$e^{x\log\left(xe^{-x}\right)^2+2xe^{5e^2+45}\log\left(xe^{-x}\right)+x+xe^{10e^2+90}}$$

44.18 Problem number 1049

$$\int \frac{\left(\frac{x+4\log\left(\frac{(-4+4x)\log(4)}{5x}\right)}{\log\left(\frac{(-4+4x)\log(4)}{5x}\right)}\right)^{\frac{1}{\log\left(x^2\right)}}\left(-x\log\left(x^2\right)+\left(-x+x^2\right)\log\left(x^2\right)\log\left(\frac{(-4+4x)\log(4)}{5x}\right)+\left(\left(2x-2x^2\right)\log\left(\frac{(-4+4x}{5x}\right.\right.\right.}{\left(-x^2+x^3\right)\log^2\left(x^2\right)\log\left(\frac{(-4+4x)\log(4)}{5x}\right)+\left(-4x+4x^2\right)\log^2\left(x^2\right.}$$

Optimal antiderivative

$$e^{\frac{\ln\left(4+\frac{x}{\ln\left(\frac{8(-1+x)\ln(2)}{5x}\right)}\right)}{\ln\left(x^2\right)}}$$

command

```
integrate((((-8*x+8)*ln(2/5*(-4+4*x)*ln(2)/x)**2+(-2*x**2+2*x)*ln(2/5*(-4+4*x)*ln(2)/x))*ln((
4+4*x)*ln(2)/x)+x)/ln(2/5*(-4+4*x)*ln(2)/x))+(x**2-x)*ln(x**2)*ln(2/5*(-4+4*x)*ln(2)/x)-
x*ln(x**2))*exp(ln((4*ln(2/5*(-4+4*x)*ln(2)/x)+x)/ln(2/5*(-4+4*x)*ln(2)/x))/ln(x**2))/((4*x**
4*x)*ln(x**2)**2*ln(2/5*(-4+4*x)*ln(2)/x)**2+(x**3-x**2)*ln(x**2)**2*ln(2/5*(-4+4*x)*ln(2)/x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$e^{\frac{\log\left(\frac{x+4\log\left(\frac{\left(\frac{8x}{5}-\frac{8}{5}\right)\log(2)}{x}\right)}{\log\left(\frac{\left(\frac{8x}{5}-\frac{8}{5}\right)\log(2)}{x}\right)}\right)}{\log\left(x^2\right)}}$$

44.19 Problem number 1259

$$\int \frac{e^{-\frac{x}{\log\left(\frac{48x}{4+3x}\right)}}\left(1036+(-1036-777x)\log\left(\frac{48x}{4+3x}\right)\right)}{(4+3x)\log^2\left(\frac{48x}{4+3x}\right)}\,dx$$

Optimal antiderivative

$$259\,e^{-\frac{x}{\ln\left(\frac{x}{\frac{x}{16}+\frac{1}{12}}\right)}}$$

command

```
integrate(((-777*x-1036)*ln(48*x/(4+3*x))+1036)/(4+3*x)/ln(48*x/(4+3*x))**2/exp(x/ln(48*x/(4+
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$259e^{-\frac{x}{\log\left(\frac{48x}{3x+4}\right)}}$$

44.20 Problem number 1276

$$\int \frac{e^{\frac{3-x+3\log\left(\frac{-20-5x-2x^2}{6x}\right)}{\log\left(\frac{-20-5x-2x^2}{6x}\right)}}\left(60-20x-6x^2+2x^3+\left(-20x-5x^2-2x^3\right)\log\left(\frac{-20-5x-2x^2}{6x}\right)\right)}{\left(20x+5x^2+2x^3\right)\log^2\left(\frac{-20-5x-2x^2}{6x}\right)}\,dx$$

Optimal antiderivative

$$e^{\frac{3-x}{\ln\left(-\frac{5}{6}-\frac{10}{3x}-\frac{x}{3}\right)}+3}$$

command

```
integrate(((-2*x**3-5*x**2-20*x)*ln(1/6*(-2*x**2-5*x-20)/x)+2*x**3-6*x**2-20*x+60)*exp((3*ln(
2*x**2-5*x-20)/x)+3-x)/ln(1/6*(-2*x**2-5*x-20)/x))/(2*x**3+5*x**2+20*x)/ln(1/6*(-2*x**2-
5*x-20)/x)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$e^{\frac{-x+3\log\left(\frac{-\frac{x^2}{3}-\frac{5x}{6}-\frac{10}{3}}{x}\right)+3}{\log\left(\frac{-\frac{x^2}{3}-\frac{5x}{6}-\frac{10}{3}}{x}\right)}}$$

44.21 Problem number 1331

$$\int \frac{100+40x+4x^2+\left(-50-40x-6x^2\right)\log(x)+\left(10x+2x^2\right)\log^2(x)-4x\log^3(x)+(-4+2x)\log^4(x)+2\log^5(x}{}$$

Optimal antiderivative

$$\left(\ln(x)+\frac{x+\frac{5x-5x\ln(\ln(x)-2)^2}{x}}{\ln(x)}\right)^2$$

command

```
integrate(((-50*ln(x)+100)*ln(ln(x)-2)**4+100*ln(x)*ln(ln(x)-2)**3+(-10*x*ln(x)**2+(40*x+100)
40*x-200)*ln(ln(x)-2)**2+(-20*ln(x)**3+(-20*x-100)*ln(x))*ln(ln(x)-2)+2*ln(x)**5+(2*x-
4)*ln(x)**4-4*x*ln(x)**3+(2*x**2+10*x)*ln(x)**2+(-6*x**2-40*x-50)*ln(x)+4*x**2+40*x+100)/(x*l
2*x*ln(x)**3),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$2x+\frac{\left(-10x-10\log\left(x\right)^{2}-50\right)\log\left(\log\left(x\right)-2\right)^{2}}{\log\left(x\right)^{2}}+\frac{x^{2}+10x+25}{\log\left(x\right)^{2}}+\log\left(x\right)^{2}+\frac{25\log\left(\log\left(x\right)-2\right)^{4}}{\log\left(x\right)^{2}}$$

44.22 Problem number 1387

$$\int\frac{(64-16x)\log(x)+\left(-64x+16x^{2}\right)\log(x)\log(2x)+(64-16x+(64-48x)\log(x))\log(2x)\log\left(\frac{e^{x}}{\log(2x)}\right)}{(-64x^{2}+48x^{3}-12x^{4}+x^{5})\log^{2}(x)\log(2x)}\,dx$$

Optimal antiderivative

$$\frac{16\ln\left(\frac{\mathrm{e}^{x}}{\ln(2x)}\right)}{x\left(4-x\right)^{2}\ln(x)}$$

command

```
integrate((((-48*x+64)*ln(x)-16*x+64)*ln(2*x)*ln(exp(x)/ln(2*x))+(16*x**2-64*x)*ln(x)*ln(2*x)
16*x+64)*ln(x))/(x**5-12*x**4+48*x**3-64*x**2)/ln(x)**2/ln(2*x),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{16\log\left(\frac{e^{x}}{\log\left(x\right)+\log\left(2\right)}\right)}{x^{3}\log\left(x\right)-8x^{2}\log\left(x\right)+16x\log\left(x\right)}$$

44.23 Problem number 1455

$$\int \frac{-240x-48x^2+\left(240x+48x^2\right)\log(x)+\left(\left(240x+96x^2\right)\log(x)+(45+18x)\log^2(x)\right)\log\left(\frac{16x+3\log(x)}{\log(x)}\right)\log\left(2\log\left(\frac{16x+3\log(x)}{\log(x)}\right)\right)}{\left(16x\log(x)+3\log^2(x)\right)\log\left(\frac{16x+3\log(x)}{\log(x)}\right)}$$

Optimal antiderivative

$$3\ln\left(2\ln\left(3+\frac{16x}{\ln(x)}\right)\right)(5+x)\,x+\ln(5)$$

command

```
integrate((((18*x+45)*ln(x)**2+(96*x**2+240*x)*ln(x))*ln((3*ln(x)+16*x)/ln(x))*ln(2*ln((3*ln(
48*x**2-240*x)/(3*ln(x)**2+16*x*ln(x))/ln((3*ln(x)+16*x)/ln(x)),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\left(3x^2+15x\right)\log\left(2\log\left(\frac{16x+3\log(x)}{\log(x)}\right)\right)$$

44.24 Problem number 1587

$$\int \frac{x-21x^2+20x^3+e^5\left(-20x+20x^2\right)+x\log(4x)+\left(-2x+2x^2+e^5(-2+2x)+\left(-e^5-x\right)\log(4x)\right)\log\left(e^5+\right.}{20x^3-40x^4+20x^5+e^5\left(20x^2-40x^3+20x^4\right)+\left(40x^3-40x^4+e^5\left(40x^2-40x^3\right)\right)\log(4x)+\left(20e^5x^2+20x^3\right)\mathrm{l}}$$

Optimal antiderivative

$$\frac{1+\frac{\ln\left(e^5+x\right)}{20x}}{1+\ln(4x)-x}$$

command

```
integrate((((-exp(5)-x)*ln(4*x)+(-2+2*x)*exp(5)+2*x**2-2*x)*ln(exp(5)+x)+x*ln(4*x)+(20*x**2-
20*x)*exp(5)+20*x**3-21*x**2+x)/((20*x**2*exp(5)+20*x**3)*ln(4*x)**2+((-40*x**3+40*x**2)*exp(
40*x**4+40*x**3)*ln(4*x)+(20*x**4-40*x**3+20*x**2)*exp(5)+20*x**5-40*x**4+20*x**3),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$-\frac{\log\left(x+e^5\right)}{20x^2-20x\log(4x)-20x}+\frac{1}{-x+\log(4x)+1}$$

44.25 Problem number 1657

$$\int \frac{\left(5x+4e^3x\right)\log(x)+\left(-19+e^3(8-4x)-5x\right)\log\left(\frac{1}{5}\left(38+10x+e^3(-16+8x)\right)\right)}{\left(19x+5x^2+e^3\left(-8x+4x^2\right)\right)\log^2(x)}\,dx$$

Optimal antiderivative

$$\frac{\ln\left(\frac{38}{5}+2x-\frac{8(2-x)e^3}{5}\right)}{\ln(x)}$$

command

```
integrate((((-4*x+8)*exp(3)-5*x-19)*ln(1/5*(8*x-16)*exp(3)+2*x+38/5)+(4*x*exp(3)+5*x)*ln(x))/
8*x)*exp(3)+5*x**2+19*x)/ln(x)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{\log\left(2x+\left(\frac{8x}{5}-\frac{16}{5}\right)e^3+\frac{38}{5}\right)}{\log\left(x\right)}$$

44.26 Problem number 1661

$$\int \frac{\left(-8x+4x^2\right)\log(-2+x)\log\left(\frac{1}{2}(1+2x)\right)+\left(-2x-4x^2+\left(2+3x-2x^2\right)\log(-2+x)\right)\log^2\left(\frac{1}{2}(1+2x)\right)}{\left(-2x^2-3x^3+2x^4\right)\log^3(-2+x)}\,dx$$

Optimal antiderivative

$$\frac{\ln\left(\frac{1}{2}+x\right)^2}{x\ln(-2+x)^2}$$

command

```
integrate((((-2*x**2+3*x+2)*ln(-2+x)-4*x**2-2*x)*ln(1/2+x)**2+(4*x**2-8*x)*ln(-2+x)*ln(1/2+x)
3*x**3-2*x**2)/ln(-2+x)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{\log\left(x+\frac{1}{2}\right)^2}{x\log\left(x-2\right)^2}$$

44.27 Problem number 1705

$$\int \frac{4x^5+x^3\log(x)+\left(-32x^3\log\left(\frac{4}{x}\right)+64x^3\log\left(\frac{4}{x}\right)\log(x)\right)\log\left(\log\left(\frac{4}{x}\right)\right)\log\left(\log\left(\log\left(\frac{4}{x}\right)\right)\right)\log\left(\log\left(\log\left(\log\left(\frac{4}{x}\right)\right)\right)\right)}{\left(64x^6\log\left(\frac{4}{x}\right)+48x^4\log\left(\frac{4}{x}\right)\log(x)+12x^2\log\left(\frac{4}{x}\right)\log^2(x)+\right.}$$

Optimal antiderivative

$$\frac{16-\ln\left(\ln\left(\ln\left(\ln\left(\frac{4}{x}\right)\right)\right)\right)}{\left(4+\frac{\ln(x)}{x^2}\right)^2}$$

command

```
integrate(((-4*x**3*ln(4/x)*ln(x)+2*x**3*ln(4/x))*ln(ln(4/x))*ln(ln(ln(4/x)))*ln(ln(ln(ln(4/x
32*x**3*ln(4/x))*ln(ln(4/x))*ln(ln(ln(4/x)))*ln(ln(ln(ln(4/x))))+x**3*ln(x)+4*x**5)/(ln(4/x)*
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$-\frac{x^4\log\left(\log\left(\log\left(\log\left(-\log\left(x\right)+\log\left(4\right)\right)\right)\right)\right)}{16x^4+8x^2\log\left(x\right)+\log\left(x\right)^2}+\frac{16x^4}{16x^4+8x^2\log\left(x\right)+\log\left(x\right)^2}$$

44.28 Problem number 1820

$$\int \frac{\log(x)\log^2(\log(x))+e^{\frac{2x^2}{\log(\log(x))}}\left(-2x+4x\log(x)\log(\log(x))\right)}{\log(x)\log^2(\log(x))}\,dx$$

Optimal antiderivative

$$\mathrm{e}^5+x-41+\mathrm{e}^{\frac{2x^2}{\ln(\ln(x))}}$$

command

```
integrate(((4*x*ln(x)*ln(ln(x))-2*x)*exp(x**2/ln(ln(x)))**2+ln(x)*ln(ln(x))**2)/ln(x)/ln(ln(x
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$x+e^{\frac{2x^2}{\log\left(\log\left(x\right)\right)}}$$

44.29 Problem number 2019

$$\int \frac{e^{\frac{-2-x}{\left(-x+2x^3\right)\log(x)}}\left(-2-x+4x^2+2x^3+\left(-2+12x^2+4x^3\right)\log(x)\right)}{\left(x^2-4x^4+4x^6\right)\log^2(x)}\,dx$$

Optimal antiderivative

$$e^{\frac{2+x}{\ln(x)\left(-2x^3+x\right)}}$$

command

```
integrate(((4*x**3+12*x**2-2)*ln(x)+2*x**3+4*x**2-x-2)*exp((-2-x)/(2*x**3-x)/ln(x))/(4*x**6-
4*x**4+x**2)/ln(x)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$e^{\frac{-x-2}{\left(2x^3-x\right)\log(x)}}$$

44.30 Problem number 2117

$$\int \frac{4x^3+4x^2\log(5)+\left(x-8x^4+\left(1-8x^2-8x^3\right)\log(5)\right)\log(x)\log(\log(x))+\left(4x^2+4x\log(5)+\left(-12x^3+\left(-8x-\right.\right.\right.}{}$$

Optimal antiderivative

$$\frac{x}{2}-\left(\ln\left(\frac{x^2}{\left(\ln(5)+x\right)^2\ln(\ln(x))}\right)+x\right)^2x^2$$

command

```
integrate(((-4*x*ln(5)-4*x**2)*ln(x)*ln(ln(x))*ln(x**2/(ln(5)**2+2*x*ln(5)+x**2)/ln(ln(x)))**
12*x**2-8*x)*ln(5)-12*x**3)*ln(x)*ln(ln(x))+4*x*ln(5)+4*x**2)*ln(x**2/(ln(5)**2+2*x*ln(5)+x**
8*x**3-8*x**2+1)*ln(5)-8*x**4+x)*ln(x)*ln(ln(x))+4*x**2*ln(5)+4*x**3)/(2*ln(5)+2*x)/ln(x)/ln(
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$-x^4-2x^3\log\left(\frac{x^2}{\left(x^2+2x\log(5)+\log(5)^2\right)\log(\log(x))}\right)$$
$$-x^2\log\left(\frac{x^2}{\left(x^2+2x\log(5)+\log(5)^2\right)\log(\log(x))}\right)^2+\frac{x}{2}$$

44.31 Problem number 2240

$$\int \frac{e^{\frac{135x}{-5x^2+\log(x)}}\left(-270x+1350x^3+50x^4+\left(270x-20x^2\right)\log(x)+2\log^2(x)\right)}{375x^4-150x^2\log(x)+15\log^2(x)}\,dx$$

Optimal antiderivative

$$\frac{2x\,\mathrm{e}^{\frac{27}{\frac{\ln(x)}{5x}-x}}}{15}$$

command

```
integrate((2*ln(x)**2+(-20*x**2+270*x)*ln(x)+50*x**4+1350*x**3-270*x)*exp(135*x/(ln(x)-
5*x**2))/(15*ln(x)**2-150*x**2*ln(x)+375*x**4),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{2xe^{\frac{135x}{-5x^2+\log(x)}}}{15}$$

44.32 Problem number 2277

$$\int \frac{8x-16x^3-16x^4+e^8\left(-48x^3-48x^4\right)+e^{12}\left(16x^3+16x^4\right)+e^4\left(-8x+48x^3+48x^4\right)+\left(-4+24x^2+16x^3-8\right.}{-16x^4+48e^4x^4-48e}$$

Optimal antiderivative

$$x+\ln(x)-\frac{\ln(\ln(x)+2)}{\left(x\,\mathrm{e}^4-x+\frac{\ln(x)}{2}\right)^2}$$

command

```
integrate((((16*x*exp(4)-16*x+8)*ln(x)+32*x*exp(4)-32*x+16)*ln(ln(x)+2)+(1+x)*ln(x)**4+((6*x*
6*x**2-4*x+2)*ln(x)**3+((12*x**3+12*x**2)*exp(4)**2+(-24*x**3-12*x**2+12*x)*exp(4)+12*x**3-
12*x)*ln(x)**2+((8*x**4+8*x**3)*exp(4)**3+(-24*x**4+24*x**2)*exp(4)**2+(24*x**4-24*x**3-
48*x**2)*exp(4)-8*x**4+16*x**3+24*x**2-4)*ln(x)+(16*x**4+16*x**3)*exp(4)**3+(-48*x**4-
48*x**3)*exp(4)**2+(48*x**4+48*x**3-8*x)*exp(4)-16*x**4-16*x**3+8*x)/(x*ln(x)**4+(6*x**2*exp(
6*x**2+2*x)*ln(x)**3+(12*x**3*exp(4)**2+(-24*x**3+12*x**2)*exp(4)+12*x**3-12*x**2)*ln(x)**2+(
24*x**4+24*x**3)*exp(4)**2+(24*x**4-48*x**3)*exp(4)-8*x**4+24*x**3)*ln(x)+16*x**4*exp(4)**3-
48*x**4*exp(4)**2+48*x**4*exp(4)-16*x**4),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$x+\log(x)-\frac{4\log(\log(x)+2)}{-8x^2e^4+4x^2+4x^2e^8-4x\log(x)+4xe^4\log(x)+\log(x)^2}$$

44.33 Problem number 2318

$$\int \frac{e^{e^{-\frac{2e^{-x}}{\log(x)}}-x-\frac{2e^{-x}}{\log(x)}}\left(10-2e^x+2x+\left(10x-2e^xx+2x^2\right)\log(x)+e^{\frac{2e^{-x}}{\log(x)}}\left(e^xx-e^{2x}x\right)\log^2(x)\right)}{x\log^2(x)}\,dx$$

Optimal antiderivative

$$\mathrm{e}^{\mathrm{e}^{-\frac{2\mathrm{e}^{-x}}{\ln(x)}}}\left(x-\mathrm{e}^x+5\right)$$

command

```
integrate(((-x*exp(x)**2+exp(x)*x)*ln(x)**2*exp(1/exp(x)/ln(x))**2+(-2*exp(x)*x+2*x**2+10*x)*
2*exp(x)+2*x+10)*exp(1/exp(1/exp(x)/ln(x))**2)/x/exp(x)/ln(x)**2/exp(1/exp(x)/ln(x))**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\left(xe^{-x}-1+5e^{-x}\right)e^xe^{e^{-\frac{2e^{-x}}{\log(x)}}}$$

44.34 Problem number 2344

$$\int \frac{x^2+2x\log(x)+\log^2(x)+e^{\frac{2\left(25+ex^2+ex\log(x)\right)}{x^2+x\log(x)}}\left(-25-50x+x^3+\left(-25+2x^2\right)\log(x)+x\log^2(x)\right)}{x^2+2x\log(x)+\log^2(x)}\,dx$$

Optimal antiderivative

$$x+\frac{x^2\mathrm{e}^{\frac{50}{x(x+\ln(x))}+2\,\mathrm{e}}}{2}+4$$

command

```
integrate(((x*ln(x)**2+(2*x**2-25)*ln(x)+x**3-50*x-25)*exp((x*exp(1)*ln(x)+x**2*exp(1)+25)/(x
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{x^2e^{\frac{2\left(ex^2+ex\log(x)+25\right)}{x^2+x\log(x)}}}{2}+x$$

44.35 Problem number 2398

$$\int \frac{-4x\log(x)+4e^{2x+4e^{2x}x^2}x^2(8+8x)\log(x)+\left(2x+e^{4e^{2x}x^2}(-2-2\log(x))+2x\log(x)\right)\log\left(e^{8e^{2x}x^2}-2e^{4e^{2x}x^2}x\right.}{e^{4e^{2x}x^2}x^2\log^2(x)-x^3\log^2(x)}$$

Optimal antiderivative

$$\frac{2\ln\left(\left(\mathrm{e}^{4\,\mathrm{e}^{2x}x^2}-x\right)^2\right)}{x\ln(x)}$$

command

```
integrate((((-2*ln(x)-2)*exp(exp(ln(2*x)+x)**2)+2*x*ln(x)+2*x)*ln(exp(exp(ln(2*x)+x)**2)**2-
2*x*exp(exp(ln(2*x)+x)**2)+x**2)+(8*x+8)*ln(x)*exp(ln(2*x)+x)**2*exp(exp(ln(2*x)+x)**2)-
4*x*ln(x))/(x**2*ln(x)**2*exp(exp(ln(2*x)+x)**2)-x**3*ln(x)**2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{2\log\left(x^2-2xe^{4x^2e^{2x}}+e^{8x^2e^{2x}}\right)}{x\log(x)}$$

44.36 Problem number 2405

$$\int \frac{e^{\frac{x^2+x\log(x)}{-x+\log\left(\frac{e^6\left(9x^2-6x^3+x^4\right)+e^3\left(-6x+2x^2\right)\log(x)+\log^2(x)}{e^6x^2}\right)}}\left(-2x+e^3\left(3x^2-x^4\right)+\left(-2+x-x^2-2e^3x^2\right)\log(x)+2\log^2(x)+\right.}{e^3\left(-3x^3+x^4\right)+x^2\log(x)+\left(e^3\left(6x^2-2x^3\right)-2x\log(x)\right)\log\left(\frac{e^6(9x^2-6x^3+x^4)+e^3(-6x+}{e^6x^2}\right.}$$

Optimal antiderivative

$$\mathrm{e}^{\frac{(x+\ln(x))x}{\ln\left(\left(-3+x+\frac{\ln(x)\mathrm{e}^{-3}}{x}\right)^2\right)-x}}$$

command

```
integrate(((ln(x)**2+((x**2-3*x)*exp(3)+2*x+1)*ln(x)+(2*x**3-5*x**2-3*x)*exp(3))*ln((ln(x)**2
6*x)*exp(3)*ln(x)+(x**4-6*x**3+9*x**2)*exp(3)**2)/x**2/exp(3)**2)+2*ln(x)**2+(-2*x**2*exp(3)-
x**2+x-2)*ln(x)+(-x**4+3*x**2)*exp(3)-2*x)*exp((x*ln(x)+x**2)/(ln((ln(x)**2+(2*x**2-
6*x)*exp(3)*ln(x)+(x**4-6*x**3+9*x**2)*exp(3)**2)/x**2/exp(3)**2)-x))/((ln(x)+(x**2-
3*x)*exp(3))*ln((ln(x)**2+(2*x**2-6*x)*exp(3)*ln(x)+(x**4-6*x**3+9*x**2)*exp(3)**2)/x**2/exp(
2*x*ln(x)+(-2*x**3+6*x**2)*exp(3))*ln((ln(x)**2+(2*x**2-6*x)*exp(3)*ln(x)+(x**4-6*x**3+9*x**2
3*x**3)*exp(3)),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$e^{\frac{x^2+x\log(x)}{-x+\log\left(\frac{\left(2x^2-6x\right)e^3\log(x)+\left(x^4-6x^3+9x^2\right)e^6+\log(x)^2}{x^2e^6}\right)}}$$

44.37 Problem number 2423

$$\int \frac{\left(16-12x^2+4x^3+e^3\left(-16x^2-16x^3+28x^4-8x^5\right)+e^3\left(-16x-16x^2+28x^3-8x^4\right)\log(x)\right)\log\left(\log^2\left(e^{-e^3(2}\right.\right.}{(x^2+x\log(x}$$

Optimal antiderivative

$$(-2+x)^2\ln\left(\ln\left(\left(x+\ln(x)\right)\mathrm{e}^{-\left(x^2+x+2\right)\mathrm{e}^3}\right)^2\right)^2$$

command

```
integrate((((2*x**2-4*x)*ln(x)+2*x**3-4*x**2)*ln((x+ln(x))/exp((x**2+x+2)*exp(3)))*ln(ln((x+l
8*x**4+28*x**3-16*x**2-16*x)*exp(3)*ln(x)+(-8*x**5+28*x**4-16*x**3-16*x**2)*exp(3)+4*x**3-
12*x**2+16)*ln(ln((x+ln(x))/exp((x**2+x+2)*exp(3)))**2))/(x*ln(x)+x**2)/ln((x+ln(x))/exp((x**
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\left(x^2-4x+4\right)\log\left(\log\left(\left(x+\log(x)\right)e^{-\left(x^2+x+2\right)e^3}\right)^2\right)^2$$

44.38 Problem number 2508

$$\int \frac{240x^2+100x^3+e^x\left(240x+100x^2\right)+\left(-120x+50x^2+e^x\left(-20x-50x^2\right)\right)\log(x)+\left(e^x(-120-50x)-120x-\right.}{\left(12x^3+5x^4+e^x\left(12x^2+5x^3\right)\right)\log^2(x)}$$

Optimal antiderivative

$$\frac{10\ln\left(\frac{(12+5x)^2}{x+\mathrm{e}^x}\right)-20x}{x\ln(x)}$$

command

```
integrate(((((-50*x-120)*exp(x)-50*x**2-120*x)*ln(x)+(-50*x-120)*exp(x)-50*x**2-120*x)*ln((25
50*x**2-20*x)*exp(x)+50*x**2-120*x)*ln(x)+(100*x**2+240*x)*exp(x)+100*x**3+240*x**2)/((5*x**3
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$-\frac{20}{\log(x)}+\frac{10\log\left(\frac{25x^2+120x+144}{x+e^x}\right)}{x\log(x)}$$

44.39 Problem number 2569

$$\int \frac{16\log^2\left(x^2\right)+e^{2e^{e^{\frac{x}{\log\left(x^2\right)}}}+4x}\left((1+4x)\log^2\left(x^2\right)+e^{e^{\frac{x}{\log\left(x^2\right)}}+\frac{x}{\log\left(x^2\right)}}\left(-4x+2x\log\left(x^2\right)\right)\right)+e^{e^{e^{\frac{x}{\log\left(x^2\right)}}}+2x}\left((8+1\right.}{\log^2\left(x^2\right)}$$

Optimal antiderivative

$$x\left(e^{e^{e^{\frac{x}{\ln\left(x^2\right)}}}+2x}+4\right)^2-4$$

command

```
integrate((((2*x*ln(x**2)-4*x)*exp(x/ln(x**2))*exp(exp(x/ln(x**2)))+(1+4*x)*ln(x**2)**2)*exp(
16*x)*exp(x/ln(x**2))*exp(exp(x/ln(x**2)))+(16*x+8)*ln(x**2)**2)*exp(exp(exp(x/ln(x**2)))+2*x
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$8xe^{2x+e^{e^{\frac{x}{\log\left(x^2\right)}}}}+xe^{4x+2e^{e^{\frac{x}{\log\left(x^2\right)}}}}+16x$$

44.40 Problem number 2570

$$\int \frac{e^{\frac{-15+5x}{\left(39x-8x^2-4x^3+x^4\right)\log(x)}}\left(-585+315x+20x^2-35x^3+5x^4+\left(-585+240x+140x^2-100x^3+15x^4\right)\log(x)\right)}{\left(1521x^2-624x^3-248x^4+142x^5-8x^7+x^8\right)\log^2(x)}\,dx$$

Optimal antiderivative

$$\ln(2)-\mathrm{e}^{\frac{5}{(3+x)\left(\frac{1}{-3+x}+x-4\right)x\ln(x)}}$$

command

```
integrate(((15*x**4-100*x**3+140*x**2+240*x-585)*ln(x)+5*x**4-35*x**3+20*x**2+315*x-
585)*exp((5*x-15)/(x**4-4*x**3-8*x**2+39*x)/ln(x))/(x**8-8*x**7+142*x**5-248*x**4-
624*x**3+1521*x**2)/ln(x)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$-e^{\frac{5x-15}{\left(x^4-4x^3-8x^2+39x\right)\log(x)}}$$

44.41 Problem number 2671

$$\int \frac{e^{-4+2e^x+2x+4x^2}(3-3x)+2x-x^2-2e^xx^2-9x^3+\left(-3e^{-4+2e^x+2x+4x^2}-x^2\right)\log\left(e^{4-2e^x-2x-4x^2}\left(3e^{-4+2e^x+2x-}\right.\right.}{3e^{-4+2e^x+3x+4x^2}+e^xx^2}$$

Optimal antiderivative

$$\left(\ln\left(x^2\mathrm{e}^{-2x\left(2x-\frac{2}{x}\right)-2x-2\,\mathrm{e}^x}+3\right)+x\right)\mathrm{e}^{-x}$$

command

```
integrate(((-3*exp(exp(x)+2*x**2+x-2)**2-x**2)*ln((3*exp(exp(x)+2*x**2+x-2)**2+x**2)/exp(exp(
2)**2)+(-3*x+3)*exp(exp(x)+2*x**2+x-2)**2-2*exp(x)*x**2-9*x**3-x**2+2*x)/(3*exp(x)*exp(exp(x)
2)**2+exp(x)*x**2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$xe^{-x}+e^{-x}\log\left(\left(x^2+3e^{4x^2+2x+2e^x-4}\right)e^{-4x^2-2x-2e^x+4}\right)$$

44.42 Problem number 2849

$$\int \frac{-6-24x+(-1-6x)\log(2x)+(24x+4\log(x)+(6x+\log(x))\log(2x)+(8+2\log(2x))\log(4+\log(2x)))\log}{24x+4\log(x)+(6x+\log(x))\log(2x)+(8+2\log(2x))\log(4+\log(2x))}$$

Optimal antiderivative

$$x\ln\left(\frac{4}{\frac{\ln(x)}{2}+3x+\ln(\ln(2x)+4)}\right)$$

command

```
integrate((((2*ln(2*x)+8)*ln(ln(2*x)+4)+(ln(x)+6*x)*ln(2*x)+4*ln(x)+24*x)*ln(8/(2*ln(ln(2*x)+
6*x-1)*ln(2*x)-24*x-6)/((2*ln(2*x)+8)*ln(ln(2*x)+4)+(ln(x)+6*x)*ln(2*x)+4*ln(x)+24*x),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$x\log\left(\frac{8}{6x+\log(x)+2\log(\log(x)+\log(2)+4)}\right)$$

44.43 Problem number 2893

$$\int \frac{20x+129x^2+50x^3+5x^4+\left(60+730x+171x^2-20x^3-5x^4\right)\log(x)+\left(-60-387x-150x^2-15x^3\right)\log\left(\frac{4x}{}\right.}{(20x+129x^2+50x^3+5x^4)\log^2(x)}$$

Optimal antiderivative

$$\frac{3\ln\left(\frac{\left(x+\frac{4}{25+5x}\right)x}{3}\right)-x-\ln(x)}{\ln(x)}$$

command

```
integrate(((-15*x**3-150*x**2-387*x-60)*ln((5*x**3+25*x**2+4*x)/(15*x+75))+(-5*x**4-
20*x**3+171*x**2+730*x+60)*ln(x)+5*x**4+50*x**3+129*x**2+20*x)/(5*x**4+50*x**3+129*x**2+20*x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$-\frac{x}{\log(x)}+\frac{3\log\left(\frac{5x^3+25x^2+4x}{15x+75}\right)}{\log(x)}$$

44.44 Problem number 2897

$$\int \frac{e^{-\frac{e^5+5x}{x}}\left(4e^{5+4e^{-\frac{e^5+5x}{x}}}+e^{\frac{e^5+5x}{x}}\left(2x^2-2x^3-6x^4+4x^5\right)+e^{2e^{-\frac{e^5+5x}{x}}}\left(e^5\left(4+4x-4x^2\right)+e^{\frac{e^5+5x}{x}}\left(2x^2-4x^3\right)\right)\right)}{x^2}$$

Optimal antiderivative

$$\left(1-x^2+\mathrm{e}^{2\,\mathrm{e}^{-5-\frac{\mathrm{e}^5}{x}}}+x\right)^2-2+\mathrm{e}^4$$

command

```
integrate((4*exp(5)*exp(2/exp((exp(5)+5*x)/x))**2+((-4*x**3+2*x**2)*exp((exp(5)+5*x)/x)+(-
4*x**2+4*x+4)*exp(5))*exp(2/exp((exp(5)+5*x)/x))+(4*x**5-6*x**4-2*x**3+2*x**2)*exp((exp(5)+5*
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: SystemError

Sympy 1.8 under Python 3.8.8 output

$$x^4-2x^3-x^2+2x+\left(-2x^2+2x+2\right)e^{2e^{-\frac{5x+e^5}{x}}}+e^{4e^{-\frac{5x+e^5}{x}}}$$

44.45 Problem number 2907

$$\int \frac{\left(-40x^2+40x^3-10x^4\right)\log^2(x)+\left(2-3x+x^2\right)\log\left(x-x^2\right)+\log(x)\left(-2+5x-2x^2+\left(2-2x+x^2\right)\log\left(x-\right.\right.}{\left(120x^2-120x^3+30x^4\right)\log^2(x)}$$

Optimal antiderivative

$$\frac{\ln((1-x)\,x)}{30\left(\frac{x}{-1+x}-x\right)\ln(x)}-\frac{x}{3}$$

command

```
integrate(((-10*x**4+40*x**3-40*x**2)*ln(x)**2+((x**2-2*x+2)*ln(-x**2+x)-2*x**2+5*x-
2)*ln(x)+(x**2-3*x+2)*ln(-x**2+x))/(30*x**4-120*x**3+120*x**2)/ln(x)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$-\frac{x}{3}+\frac{(1-x)\log\left(-x^2+x\right)}{30x^2\log(x)-60x\log(x)}$$

44.46 Problem number 3063

$$\int \frac{-2x-x^2+\left(-2-x-2x^2-2x^3-x^4\right)\log(x)+\left(-2x-4x^2-2x^3\right)\log^2(x)+\left(-2x-x^2\right)\log^3(x)+\left(2+3x+\right.}{(2x^3+x^4)\log(x)+(4x^2+2x^3)\log^2(x)+(2x+x^2)\log^3(x)}$$

Optimal antiderivative

$$13-x-\frac{\ln\left(2\ln(x)\,(2+x)^2\right)}{x+\ln(x)}$$

command

```
integrate(((x**2+3*x+2)*ln(x)*ln((2*x**2+8*x+8)*ln(x))+(-x**2-2*x)*ln(x)**3+(-2*x**3-
4*x**2-2*x)*ln(x)**2+(-x**4-2*x**3-2*x**2-x-2)*ln(x)-x**2-2*x)/((x**2+2*x)*ln(x)**3+(2*x**3+4
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$-x-\frac{\log\left(\left(2x^2+8x+8\right)\log\left(x\right)\right)}{x+\log\left(x\right)}$$

44.47 Problem number 3087

$$\int \frac{108x^3+30x^4+2x^5+\left(-108x^3-21x^4-x^5\right)\log(x)+\left(27x^3+3x^4\right)\log^2(x)+\left(\left(432x^3+105x^4+7x^5\right)\log(x)+\right.}{(36+12x+x^2)\log(x)+(-36-6x)\log^2(x)+9}$$

Optimal antiderivative

$$\frac{x^4(x+9)\ln(\ln(x))}{3-\frac{x}{\ln(x)-2}}$$

command

```
integrate((((15*x**4+108*x**3)*ln(x)**3+(-4*x**5-87*x**4-432*x**3)*ln(x)**2+(7*x**5+105*x**4+
x**5-21*x**4-108*x**3)*ln(x)+2*x**5+30*x**4+108*x**3)/(9*ln(x)**3+(-6*x-36)*ln(x)**2+(x**2+12
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{\left(-x^5\log\left(x\right)+2x^5-9x^4\log\left(x\right)+18x^4\right)\log\left(\log\left(x\right)\right)}{x-3\log\left(x\right)+6}$$

44.48 Problem number 3089

$$\int \frac{16x^2-112x^3-128x^2\log(x)+\left(-64x^2+32x^3+\left(-64x+32x^2\right)\log(x)\right)\log(x+\log(x))+\left(-8x+12x^2+(-8$$

Optimal antiderivative

$$\left(-2-\ln\left(\frac{x}{\frac{4}{\ln(x+\ln(x))}+\frac{1}{x}}-x\right)\right)^2 x$$

command

```
integrate(((((-1+x)*ln(x)+x**2-x)*ln(x+ln(x))**2+((4*x**2-8*x)*ln(x)+4*x**3-8*x**2)*ln(x+ln(x
16*x**2*ln(x)-16*x**3)*ln(((x**2-x)*ln(x+ln(x))-4*x**2)/(ln(x+ln(x))+4*x))**2+(((8*x-
6)*ln(x)+8*x**2-6*x)*ln(x+ln(x))**2+((24*x**2-48*x)*ln(x)+24*x**3-48*x**2)*ln(x+ln(x))-
96*x**2*ln(x)-88*x**3+8*x**2)*ln(((x**2-x)*ln(x+ln(x))-4*x**2)/(ln(x+ln(x))+4*x))+((12*x-
8)*ln(x)+12*x**2-8*x)*ln(x+ln(x))**2+((32*x**2-64*x)*ln(x)+32*x**3-64*x**2)*ln(x+ln(x))-
128*x**2*ln(x)-112*x**3+16*x**2)/(((-1+x)*ln(x)+x**2-x)*ln(x+ln(x))**2+((4*x**2-8*x)*ln(x)+4*
8*x**2)*ln(x+ln(x))-16*x**2*ln(x)-16*x**3),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$x\log\left(\frac{-4x^2+\left(x^2-x\right)\log\left(x+\log\left(x\right)\right)}{4x+\log\left(x+\log\left(x\right)\right)}\right)^2+4x\log\left(\frac{-4x^2+\left(x^2-x\right)\log\left(x+\log\left(x\right)\right)}{4x+\log\left(x+\log\left(x\right)\right)}\right)+4x$$

44.49 Problem number 3156

$$\int \frac{(-5-e)e^x+e^{2x}+\left(-e^x x\log(x)+\left(-5x-ex+e^x x\right)\log\left(5+e-e^x\right)\log(x)\right)\log(\log(x))}{\left(e^{2x}x+e^x(-5x-ex)\right)\log(x)\log(\log(x))}\,dx$$

Optimal antiderivative

$$\ln(\ln(\ln(x)))-\ln(-\mathrm{e}^x+\mathrm{e}+5)\,\mathrm{e}^{-x}$$

command

```
integrate((((exp(x)*x-x*exp(1)-5*x)*ln(x)*ln(-exp(x)+exp(1)+5)-x*exp(x)*ln(x))*ln(ln(x))+exp(
exp(1)-5)*exp(x))/(x*exp(x)**2+(-x*exp(1)-5*x)*exp(x))/ln(x)/ln(ln(x)),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\log\left(\log\left(\log\left(x\right)\right)\right)-e^{-x}\log\left(-e^x+e+5\right)$$

44.50 Problem number 3383

$$\int \frac{\left(4-4e^4+e^8\right)\log^2(x)+\left(-4+2e^4\right)\log^2(x)\log\left(4x^2\right)+\log^2(x)\log^2\left(4x^2\right)+e^{\frac{4}{-2+e^4+\log\left(4x^2\right)}}\left(4-4e^4+e^8+\left(4+\right.\right.}{\left(4-4e^4+e^8\right)\log^2(x)+\left(-4+2e^4\right)\log^2(x)\log(4}$$

Optimal antiderivative

$$\left(\frac{1-x}{x}-\frac{\mathrm{e}^{\frac{4}{\ln\left(4x^2\right)+\mathrm{e}^4-2}}}{\ln(x)}+2\right)x$$

command

```
integrate((((1-ln(x))*ln(4*x**2)**2+((-2*exp(4)+4)*ln(x)+2*exp(4)-4)*ln(4*x**2)+(-
exp(4)**2+4*exp(4)+4)*ln(x)+exp(4)**2-4*exp(4)+4)*exp(4/(ln(4*x**2)+exp(4)-2))+ln(x)**2*ln(4*
4)*ln(x)**2*ln(4*x**2)+(exp(4)**2-4*exp(4)+4)*ln(x)**2)/(ln(x)**2*ln(4*x**2)**2+(2*exp(4)-
4)*ln(x)**2*ln(4*x**2)+(exp(4)**2-4*exp(4)+4)*ln(x)**2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$-\frac{xe^{\frac{4}{2\log(x)-2+\log(4)+e^4}}}{\log(x)}+x$$

44.51 Problem number 3596

$$\int \frac{\left(12x+18x^2+e^x\left(12+12x+6x^2\right)+\left(6x+6e^xx\right)\log(x)\right)\log\left(25e^xx^2+25x^3+\left(50e^xx+50x^2\right)\log(x)+\left(25e^x+\right.\right.}{2e^xx+2x^2}$$

Optimal antiderivative

$$\frac{3x\ln(5(x+\ln(x))\left(5x+5\ln(x)\right)\left(x+\mathrm{e}^x\right))^2}{2}$$

command

```
integrate((((3*exp(x)+3*x)*ln(x)+3*exp(x)*x+3*x**2)*ln((25*exp(x)+25*x)*ln(x)**2+(50*exp(x)*x
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{3x\log\left(25x^3+25x^2e^x+\left(25x+25e^x\right)\log(x)^2+\left(50x^2+50xe^x\right)\log(x)\right)^2}{2}$$

44.52 Problem number 3706

$$\int \frac{1+2x+x^2+x^{\frac{-x-2x^2}{1+x}}\left(-1-x+2x^2+2x^3+\left(x+4x^2+2x^3\right)\log(x)\right)}{1+2x+x^2}\,dx$$

Optimal antiderivative

$$-5-x\,\mathrm{e}^{\ln(x)\left(\frac{x^2}{-1-x}-x\right)}+x$$

command

```
integrate((((2*x**3+4*x**2+x)*ln(x)+2*x**3+2*x**2-x-1)*exp((-2*x**2-x)*ln(x)/(1+x))+x**2+2*x+
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-xe^{\frac{\left(-2x^2-x\right)\log(x)}{x+1}}+x$$

44.53 Problem number 3715

$$\int \frac{-3e^x x+e^{2x}x^2+\left(12+4e^x x^2\right)\log\left(\frac{9-6e^x x+e^{2x}x^2}{e^{8/5}x^2}\right)+\left(3x-e^x x^2\right)\log^2\left(\frac{9-6e^x x+e^{2x}x^2}{e^{8/5}x^2}\right)}{-3e^x x+e^{2x}x^2}\,dx$$

Optimal antiderivative

$$x+\ln\left(\left(\mathrm{e}^x-\frac{3}{x}\right)^2\mathrm{e}^{-\frac{8}{5}}\right)^2\mathrm{e}^{-x}$$

command

```
integrate(((-exp(x)*x**2+3*x)*ln((exp(x)**2*x**2-6*exp(x)*x+9)/x**2/exp(4/5)**2)**2+(4*exp(x)
6*exp(x)*x+9)/x**2/exp(4/5)**2)+exp(x)**2*x**2-3*exp(x)*x)/(exp(x)**2*x**2-3*exp(x)*x),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$x+e^{-x}\log\left(\frac{x^2e^{2x}-6xe^x+9}{x^2e^{\frac{8}{5}}}\right)^2$$

44.54 Problem number 3737

$$\int \frac{e^{4-100e^{4-2x}-x}\left(e^{-4+2x}(-1+x)+200x\right)}{x^2}\,dx$$

Optimal antiderivative

$$5+\frac{\mathrm{e}^{x}\mathrm{e}^{-100\,\mathrm{e}^{4-2x}}}{x}$$

command

```
integrate(((-1+x)*exp(-2+x)**2+200*x)*exp(x)/x**2/exp(-2+x)**2/exp(100/exp(-2+x)**2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: SystemError

Sympy 1.8 under Python 3.8.8 output

$$\frac{e^{x}e^{-100e^{4}e^{-2x}}}{x}$$

44.55 Problem number 3939

$$\int \frac{e^{-2-e^{\frac{-x+(4-\log(3))\log\left(x^3\right)}{\log\left(x^3\right)}}-x\left(e^{\frac{-x+(4-\log(3))\log\left(x^3\right)}{\log\left(x^3\right)}}\left(-3+\log\left(x^3\right)\right)-\log^2\left(x^3\right)\right)}}{\log^2\left(x^3\right)}\,dx$$

Optimal antiderivative

$$\mathrm{e}^{-2-x-\mathrm{e}^{4-\frac{x}{\ln\left(x^3\right)}-\ln(3)}}$$

command

```
integrate(((ln(x**3)-3)*exp(((-ln(3)+4)*ln(x**3)-x)/ln(x**3))-ln(x**3)**2)*exp(-exp(((-
ln(3)+4)*ln(x**3)-x)/ln(x**3))-x-2)/ln(x**3)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$e^{-x-e^{\frac{-x+(4-\log(3))\log\left(x^3\right)}{\log\left(x^3\right)}}-2}$$

44.56 Problem number 4051

$$\int \frac{e^{\frac{4x^2+x^2\log(169)}{20\log(50-x)}}\left(-4x^2-x^2\log(169)+\left(-400x+8x^2+\left(-100x+2x^2\right)\log(169)\right)\log(50-x)\right)}{(-1000+20x)\log^2(50-x)}\,dx$$

Optimal antiderivative

$$\mathrm{e}^{\frac{x^2\left(\frac{4}{5}+\frac{2\ln(13)}{5}\right)}{4\ln(-x+50)}}$$

command

```
integrate(((2*(2*x**2-100*x)*ln(13)+8*x**2-400*x)*ln(-x+50)-2*x**2*ln(13)-4*x**2)*exp(1/20*(2
x+50))/(20*x-1000)/ln(-x+50)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$e^{\frac{\frac{x^2}{5}+\frac{x^2\log(13)}{10}}{\log(50-x)}}$$

44.57 Problem number 4056

$$\int \frac{e^{\frac{1}{15}\left(12+5e^{\frac{2-16x+4x^2+4x\log\left(25+10x+x^2\right)}{-4x+x^2+x\log\left(25+10x+x^2\right)}}x\right)+\frac{2-16x+4x^2+4x\log\left(25+10x+x^2\right)}{-4x+x^2+x\log\left(25+10x+x^2\right)}}\left(40+64x-28x^2-3x^3+x^4+\left(-10-42x+2x^2\right.\right.}{240x-72x^2-9x^3+3x^4+(-120x+6x^2+6x^3)\log(25+10x+x^2)+(15x}$$

Optimal antiderivative

$$\mathrm{e}^{\frac{x\,\mathrm{e}^{4-\frac{2}{x\left(5-\ln\left((5+x)^2\right)-x\right)-x}}}{3}+\frac{4}{5}}$$

command

```
integrate(((x**2+5*x)*ln(x**2+10*x+25)**2+(2*x**3+2*x**2-42*x-10)*ln(x**2+10*x+25)+x**4-
3*x**3-28*x**2+64*x+40)*exp((4*x*ln(x**2+10*x+25)+4*x**2-16*x+2)/(x*ln(x**2+10*x+25)+x**2-
4*x))*exp(1/3*x*exp((4*x*ln(x**2+10*x+25)+4*x**2-16*x+2)/(x*ln(x**2+10*x+25)+x**2-
4*x))+4/5)/((3*x**2+15*x)*ln(x**2+10*x+25)**2+(6*x**3+6*x**2-120*x)*ln(x**2+10*x+25)+3*x**4-
9*x**3-72*x**2+240*x),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$e^{\frac{xe^{\frac{4x^2+4x\log\left(x^2+10x+25\right)-16x+2}{x^2+x\log\left(x^2+10x+25\right)-4x}}}{3}+\frac{4}{5}}$$

44.58 Problem number 4088

$$\int \frac{\left(-2e^x x+2x^2\right)\log^2(x)+\left(\left(e^x(-10-2x)+10x+2x^2\right)\log^2(x)+\left(10x+12x^2+2x^3+e^{2x}\left(10x+2x^2\right)+e^x\left(-1\right.\right.\right.}{}$$

Optimal antiderivative

$$2x+\left(\mathrm{e}^x-x-\frac{\ln(x\ln(5+x))}{\ln(x)}\right)^2+2$$

command

```
integrate(((-2*x-10)*ln(5+x)*ln(x*ln(5+x))**2+((((-2*x**2-10*x)*exp(x)+2*x**2+10*x)*ln(x)**2+
2*x**2-8*x+10)*ln(x))*ln(5+x)+2*x*ln(x))*ln(x*ln(5+x))+(((2*x**2+10*x)*exp(x)**2+(-
2*x**3-12*x**2-10*x)*exp(x)+2*x**3+12*x**2+10*x)*ln(x)**3+((-2*x-10)*exp(x)+2*x**2+10*x)*ln(x
2*exp(x)*x+2*x**2)*ln(x)**2)/(x**2+5*x)/ln(x)**3/ln(5+x),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$x^2+2x+\frac{2x\log\left(x\log\left(x+5\right)\right)}{\log\left(x\right)}+\frac{\left(-2x\log\left(x\right)-2\log\left(x\log\left(x+5\right)\right)\right)e^x+e^{2x}\log\left(x\right)}{\log\left(x\right)}+\frac{\log\left(x\log\left(x+5\right)\right)^2}{\log\left(x\right)^2}$$

44.59 Problem number 4109

$$\int \frac{30x^2-10x^4+\left(30-10x^2+9x^5-6x^7+x^9-60x^6\log(3)\right)\log(x)+\left(18x^3-12x^5+2x^7-120x^4\log(3)\right)\log^2(x}{\left(9x^5-6x^7+x^9\right)\log(x)+\left(18x^3-12x^5+2x^7\right.}$$

Optimal antiderivative

$$x-\frac{10\left(\frac{\ln(\ln(x))}{\ln(x)+x^2}-3\ln(3)\right)}{x^2-3}$$

command

```
integrate(((20*x**2*ln(x)**2+(40*x**4-50*x**2-30)*ln(x))*ln(ln(x))+(-60*x**2*ln(3)+x**5-
6*x**3+9*x)*ln(x)**3+(-120*x**4*ln(3)+2*x**7-12*x**5+18*x**3)*ln(x)**2+(-60*x**6*ln(3)+x**9-
6*x**7+9*x**5-10*x**2+30)*ln(x)-10*x**4+30*x**2)/((x**5-6*x**3+9*x)*ln(x)**3+(2*x**7-
12*x**5+18*x**3)*ln(x)**2+(x**9-6*x**7+9*x**5)*ln(x)),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$x-\frac{10\log\left(\log\left(x\right)\right)}{x^4+x^2\log\left(x\right)-3x^2-3\log\left(x\right)}+\frac{30\log\left(3\right)}{x^2-3}$$

44.60 Problem number 4134

$$\int \frac{e^{\frac{-15+3x}{x+\log(x)}}\left(15x^3+12x^4+3x^5+e^x\left(-15-12x-x^3\right)+\left(-15x^2-12x^3-2x^4\right)\log(15)+\left(9x^4+e^x\left(-3x-2x^2\right)-\right.\right.}{2x^3+4x^2\log(x)+2x\log^2(x)}$$

Optimal antiderivative

$$\frac{\left(x^2(x-\ln(15))-\mathrm{e}^x\right)\mathrm{e}^{\frac{-5+x}{\frac{x}{3}+\frac{\ln(x)}{3}}}}{2}$$

command

```
integrate(((-exp(x)*x-2*x**2*ln(15)+3*x**3)*ln(x)**2+((-2*x**2-3*x)*exp(x)-7*x**3*ln(15)+9*x*
x**3-12*x-15)*exp(x)+(-2*x**4-12*x**3-15*x**2)*ln(15)+3*x**5+12*x**4+15*x**3)*exp((3*x-
15)/(x+ln(x)))/(2*x*ln(x)**2+4*x**2*ln(x)+2*x**3),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{\left(x^3-x^2\log\left(15\right)-e^x\right)e^{\frac{3x-15}{x+\log\left(x\right)}}}{2}$$

44.61 Problem number 4177

$$\int \frac{e^{-\frac{180x^3}{(-1+x)\log(x)}}\left(-180x^2+180x^3+\left(540x^2-360x^3\right)\log(x)\right)}{\left(1-2x+x^2\right)\log^2(x)}\,dx$$

Optimal antiderivative

$$\mathrm{e}^{\frac{180x^3}{\ln(x)(1-x)}}$$

command

```
integrate(((-360*x**3+540*x**2)*ln(x)+180*x**3-180*x**2)*exp(-180*x**3/(-1+x)/ln(x))/(x**2-
2*x+1)/ln(x)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$e^{-\frac{180x^3}{(x-1)\log\left(x\right)}}$$

44.62 Problem number 4204

$$\int \frac{\left(-128x^3+256x^4+\left(128x^2-256x^3\right)\log(2)+\left(-128x^2+256x^3+\left(128x-256x^2\right)\log(2)\right)\log(x)\right)\log\left(-12-x\right.}{-12x^3-x^4+x^5+\left(-24x^2-2x^3+\right.}$$

Optimal antiderivative

$$\frac{64\ln((3+x)\left(-4+x\right))^2\left(x-\ln(2)\right)}{x+\ln(x)}$$

command

```
integrate((((64*x**3-64*x**2-768*x)*ln(x)+(64*x**3-832*x-768)*ln(2)-64*x**3+64*x**2+768*x)*ln
x-12)**2+(((-256*x**2+128*x)*ln(2)+256*x**3-128*x**2)*ln(x)+(-256*x**3+128*x**2)*ln(2)+256*x*
128*x**3)*ln(x**2-x-12))/((x**3-x**2-12*x)*ln(x)**2+(2*x**4-2*x**3-24*x**2)*ln(x)+x**5-
x**4-12*x**3),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{\left(64x-64\log\left(2\right)\right)\log\left(x^2-x-12\right)^2}{x+\log\left(x\right)}$$

44.63 Problem number 4469

$$\int \frac{12x+16x^2+\left(-14x-8x^2\right)\log(x)+\left(3x+10x^2+8x^3\right)\log^3(x)+(12+16x)\log(3+4x)}{\left(3x+4x^2\right)\log^3(x)}\,dx$$

Optimal antiderivative

$$x+x^2-\frac{2\ln(3+4x)+2x}{\ln(x)^2}-2$$

command

```
integrate(((16*x+12)*ln(3+4*x)+(8*x**3+10*x**2+3*x)*ln(x)**3+(-8*x**2-14*x)*ln(x)+16*x**2+12*
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$x^2+x-\frac{2x}{\log\left(x\right)^2}-\frac{2\log\left(4x+3\right)}{\log\left(x\right)^2}$$

44.64 Problem number 4629

$$\int \frac{81x^2+18x^4+x^6+\left(162x+18x^3\right)\log(2)+81\log^2(2)+\left(-81x^2-18x^3-18x^4-2x^5-x^6+\left(-162x-18x^2-\right.\right.}$$

Optimal antiderivative

$$\frac{\ln(x)-\mathrm{e}^{\frac{1}{3x+\frac{x^2(x-\ln(x))}{3}+3\ln(2)}}}{x}$$

command

```
integrate(((x**4*ln(x)**2+(-18*x**2*ln(2)-2*x**5-18*x**3-6*x**2)*ln(x)+81*ln(2)**2+(18*x**3+1
3/(x**2*ln(x)-9*ln(2)-x**3-9*x))-x**4*ln(x)**3+(18*x**2*ln(2)+2*x**5+x**4+18*x**3)*ln(x)**2+(
81*ln(2)**2+(-18*x**3-18*x**2-162*x)*ln(2)-x**6-2*x**5-18*x**4-18*x**3-81*x**2)*ln(x)+81*ln(2
18*x**4*ln(2)-2*x**7-18*x**5)*ln(x)+81*x**2*ln(2)**2+(18*x**5+162*x**3)*ln(2)+x**8+18*x**6+81
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{\log\left(x\right)}{x}-\frac{e^{-\frac{3}{-x^3+x^2\log\left(x\right)-9x-9\log\left(2\right)}}}{x}$$

44.65 Problem number 4683

$$\int \frac{-3x^2+6x^3+e^x\left(2x^2+6x^3-2x^4\right)+\left(-6x^2+e^x\left(-8x-4x^2+4x^3\right)\right)\log\left(\frac{1}{3}e^{-2x}\left(-3x+e^x\left(-4-2x+2x^2\right)\right)\right)1}{\left(-3x+e^x\left(-4-2x+2x^2\right)\right)\log\left(\frac{1}{3}e^{-2x}\left(-3x+e^x\left(-4-2x+2x^2\right)\right)\right.}$$

Optimal antiderivative

$$x^2\ln\left(\ln\left(\frac{\left(2x^2-4-x(3\,\mathrm{e}^{-x}+2)\right)\mathrm{e}^{-x}}{3}\right)\right)$$

command

```
integrate((((4*x**3-4*x**2-8*x)*exp(x)-6*x**2)*ln(1/3*((2*x**2-2*x-4)*exp(x)-3*x)/exp(x)**2)*
2*x-4)*exp(x)-3*x)/exp(x)**2))+(-2*x**4+6*x**3+2*x**2)*exp(x)+6*x**3-3*x**2)/((2*x**2-
2*x-4)*exp(x)-3*x)/ln(1/3*((2*x**2-2*x-4)*exp(x)-3*x)/exp(x)**2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$x^2\log\left(\log\left(\left(-x+\frac{\left(2x^2-2x-4\right)e^x}{3}\right)e^{-2x}\right)\right)$$

44.66 Problem number 4944

$$\int \frac{\left(6x^2+2x^3\right)\log(1-x)+\left(3+x-4x^2\right)\log^2(1-x)+\left(\left(6x+2x^2\right)\log(1-x)+\left(-x+x^2\right)\log^2(1-x)\right)\log(x)}{-x^3+x^4+\left(-2x^2+2x^3\right)\log(x)+\left(-x+x^2\right)\log^2(x)}\,dx$$

Optimal antiderivative

$$\frac{\ln(1-x)^2\,(3+x)}{x+\ln(x)}$$

command

```
integrate((((x**2-x)*ln(1-x)**2+(2*x**2+6*x)*ln(1-x))*ln(x)+(-4*x**2+x+3)*ln(1-x)**2+(2*x**3+
x))/((x**2-x)*ln(x)**2+(2*x**3-2*x**2)*ln(x)+x**4-x**3),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{(x+3)\log\left(1-x\right)^2}{x+\log\left(x\right)}$$

44.67 Problem number 5196

$$\int \frac{16x^5+4x^6+e^{\frac{3(-1+2x)}{x}}\left(-1296x-756x^2\right)+e^{\frac{4(-1+2x)}{x}}\left(1296+324x-108x^2\right)+e^{\frac{2(-1+2x)}{x}}\left(432x^2+540x^3+72x^4\right)}{}$$

Optimal antiderivative

$$\left(\mathrm{e}^{2-\frac{1}{x}}(3-\ln(4+x))-x\right)^4$$

command

```
integrate(((4*x+16)*exp((-1+2*x)/x)**4*ln(4+x)**4+((4*x**2-48*x-192)*exp((-1+2*x)/x)**4+(4*x*
1+2*x)/x)**3)*ln(4+x)**3+((-36*x**2+216*x+864)*exp((-1+2*x)/x)**4+(-24*x**3-252*x**2-
432*x)*exp((-1+2*x)/x)**3+(12*x**4+60*x**3+48*x**2)*exp((-1+2*x)/x)**2)*ln(4+x)**2+((108*x**2
432*x-1728)*exp((-1+2*x)/x)**4+(36*x**3+756*x**2+1296*x)*exp((-1+2*x)/x)**3+(-60*x**4-
360*x**3-288*x**2)*exp((-1+2*x)/x)**2+(12*x**5+52*x**4+16*x**3)*exp((-1+2*x)/x))*ln(4+x)+(-
108*x**2+324*x+1296)*exp((-1+2*x)/x)**4+(-756*x**2-1296*x)*exp((-1+2*x)/x)**3+(72*x**4+540*x*
1+2*x)/x)**2+(-32*x**5-156*x**4-48*x**3)*exp((-1+2*x)/x)+4*x**6+16*x**5)/(x**3+4*x**2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$x^4 + \left(4x^3 \log\left(x+4\right) - 12x^3\right) e^{\frac{2x-1}{x}} + \left(6x^2 \log\left(x+4\right)^2 - 36x^2 \log\left(x+4\right) + 54x^2\right) e^{\frac{2(2x-1)}{x}} + \left(4x \log\left(x+4\right)^3 - 36x \log\left(x+4\right)^2 + 108x \log\left(x+4\right) - 108x\right) e^{\frac{3(2x-1)}{x}} + \left(\log\left(x+4\right)^4 - 12 \log\left(x+4\right)^3 + 54 \log\left(x+4\right)^2 - 108 \log\left(x+4\right) + 81\right) e^{\frac{4(2x-1)}{x}}$$

44.68 Problem number 5357

$$\int \frac{e^x x \log(x) + e^x x^2 \log^2(x) + e^{e^{3e^{-x}}} \left(-3e^{3e^{-x}} x \log(x) + e^x x \log^2(x)\right) + \left(-e^{e^{3e^{-x}}+x} - e^x x\right) \log\left(e^{e^{3e^{-x}}} + x\right)}{e^{e^{3e^{-x}}+x} x \log^2(x) + e^x x^2 \log^2(x)} \, dx$$

Optimal antiderivative

$$\frac{\ln\left(\mathrm{e}^{\mathrm{e}^{3\,\mathrm{e}^{-x}}} + x\right)}{\ln(x)} + x$$

command

```
integrate(((-exp(x)*exp(exp(3/exp(x)))-exp(x)*x)*ln(exp(exp(3/exp(x)))+x)+(-3*x*ln(x)*exp(3/e
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$x + \frac{\log\left(x + e^{e^{3e^{-x}}}\right)}{\log\left(x\right)}$$

44.69 Problem number 5388

$$\int \frac{\left(-8x + 8x^2 + \left(3x - 4x^2 + x^3\right) \log(x)\right) \log\left(\frac{1}{3}(8 + (-3+x)\log(x))\right) + \left(-6 + 8x - 2x^2 + \left(2x - 2x^2\right)\log(x)\right) \log$$

Optimal antiderivative

$$\frac{\left(1 + \ln\left(\ln\left(\frac{\ln(x)(-3+x)}{3} + \frac{8}{3}\right)\right)^2 - x\right)\left(\frac{1}{2} + \frac{\ln\left(\ln\left(\frac{\ln(x)(-3+x)}{3} + \frac{8}{3}\right)\right)^2}{2} - \frac{x}{2}\right)}{2}$$

command

```
integrate(((2*x*ln(x)+2*x-6)*ln(ln(1/3*ln(x)*(-3+x)+8/3))**3+((-x**2+3*x)*ln(x)-8*x)*ln(1/3*l
3+x)+8/3)*ln(ln(1/3*ln(x)*(-3+x)+8/3))**2+((-2*x**2+2*x)*ln(x)-2*x**2+8*x-6)*ln(ln(1/3*ln(x)*
3+x)+8/3))+((x**3-4*x**2+3*x)*ln(x)+8*x**2-8*x)*ln(1/3*ln(x)*(-3+x)+8/3))/((2*x**2-
6*x)*ln(x)+16*x)/ln(1/3*ln(x)*(-3+x)+8/3),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{x^2}{4}-\frac{x}{2}+\left(\frac{1}{2}-\frac{x}{2}\right)\log\left(\log\left(\frac{(x-3)\log(x)}{3}+\frac{8}{3}\right)\right)^2+\frac{\log\left(\log\left(\frac{(x-3)\log(x)}{3}+\frac{8}{3}\right)\right)^4}{4}$$

44.70 Problem number 5539

$$\int \frac{e^{-\frac{1250}{x\log(2x)}}(-2500-2500\log(2x))+e^{-\frac{2500}{x\log(2x)}}(2500+2500\log(2x))}{x^2\log^2(2x)}\,dx$$

Optimal antiderivative

$$\left(1-\mathrm{e}^{-\frac{1250}{x\ln(2x)}}\right)^2$$

command

```
integrate(((2500*ln(2*x)+2500)*exp(-1250/x/ln(2*x))**2+(-2500*ln(2*x)-2500)*exp(-1250/x/ln(2*
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$-2e^{-\frac{1250}{x\log(2x)}}+e^{-\frac{2500}{x\log(2x)}}$$

44.71 Problem number 5630

$$\int \frac{5^{\frac{5}{\left(x+x^2\log(5)\right)\log(x)}}e^{-4+5^{\frac{5}{\left(x+x^2\log(5)\right)\log(x)}}}\left(-5\log(5)-5x\log^2(5)+\left(-5\log(5)-10x\log^2(5)\right)\log(x)\right)}{\left(x^2+2x^3\log(5)+x^4\log^2(5)\right)\log^2(x)}\,dx$$

Optimal antiderivative

$$\mathrm{e}^{-4+\mathrm{e}^{\frac{5}{\left(x^2+\frac{x}{\ln(5)}\right)\ln(x)}}}$$

command

```
integrate(((-10*x*ln(5)**2-5*ln(5))*ln(x)-5*x*ln(5)**2-5*ln(5))*exp(5*ln(5)/(x**2*ln(5)+x)/ln
4)/(x**4*ln(5)**2+2*x**3*ln(5)+x**2)/ln(x)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$e^{e^{\frac{5\log(5)}{\left(x^2\log(5)+x\right)\log(x)}}-4}$$

44.72 Problem number 5647

$$\int \frac{\left(-30-12x^2-6x^3+6x^4\right)\log^2\left(\frac{5+2x^2+x^3-x^4}{x^2}\right)+\log\left(\frac{2}{x}\right)\left(\left(60-6x^3+12x^4\right)\log\left(\frac{5+2x^2+x^3-x^4}{x^2}\right)+\left(30+12x^2+\right.\right.}{\left(-5x^3-2x^5-x^6+x^7\right)\log^3\left(\frac{2}{x}\right)}$$

Optimal antiderivative

$$\frac{3\ln\left(2+x+\frac{5}{x^2}-x^2\right)^2}{\ln\left(\frac{2}{x}\right)^2x^2}$$

command

```
integrate((((-6*x**4+6*x**3+12*x**2+30)*ln((-x**4+x**3+2*x**2+5)/x**2)**2+(12*x**4-
6*x**3+60)*ln((-x**4+x**3+2*x**2+5)/x**2))*ln(2/x)+(6*x**4-6*x**3-12*x**2-30)*ln((-
x**4+x**3+2*x**2+5)/x**2)**2)/(x**7-x**6-2*x**5-5*x**3)/ln(2/x)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{3\log\left(\frac{-x^4+x^3+2x^2+5}{x^2}\right)^2}{x^2\log\left(\frac{2}{x}\right)^2}$$

44.73 Problem number 5655

$$\int \frac{e^{\frac{1}{3}(-4-15x)}\left(-75\log^2(x)+e^{\frac{2}{3}\left(-1+e^{\frac{x}{\log(x)}}\right)}\left(-75\log^2(x)+e^{\frac{x}{\log(x)}}(-10+10\log(x))\right)\right)}{\log^2(x)}\,dx$$

Optimal antiderivative

$$15\left(\mathrm{e}^{\frac{2\,\mathrm{e}^{\frac{x}{\ln(x)}}}{3}-\frac{2}{3}}+1\right)\mathrm{e}^{-5x-\frac{4}{3}}$$

command

```
integrate((((10*ln(x)-10)*exp(x/ln(x))-75*ln(x)**2)*exp(1/3*exp(x/ln(x))-1/3)**2-75*ln(x)**2)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$15e^{-5x-\frac{4}{3}}e^{\frac{2e^{\frac{x}{\log(x)}}}{3}-\frac{2}{3}}+15e^{-5x-\frac{4}{3}}$$

44.74 Problem number 5656

$$\int \frac{\left(-250x^2+50x^3\right)\log(x)\log(3+x)+\left(375x+50x^2-25x^3+\left(-750x-250x^2\right)\log(x)\right)\log^2(3+x)}{\left(-54000+14400x+4320x^2-1728x^3+144x^4\right)\log^2(x)}\,dx$$

Optimal antiderivative

$$\frac{25x^2\ln(3+x)^2}{144\,(5-x)^2\ln(x)}$$

command

```
integrate((((-250*x**2-750*x)*ln(x)-25*x**3+50*x**2+375*x)*ln(3+x)**2+(50*x**3-250*x**2)*ln(x
1728*x**3+4320*x**2+14400*x-54000)/ln(x)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{25x^2\log(x+3)^2}{144x^2\log(x)-1440x\log(x)+3600\log(x)}$$

44.75 Problem number 5688

$$\int \frac{e^{\frac{x}{4\log(x)}}\left(-e^{\frac{625-1000x+100x^2+440x^3-71x^4-88x^5+4x^6+8x^7+x^8}{x^4}}x^5-x^6-x^7+\left(e^{\frac{625-1000x+100x^2+440x^3-71x^4-88x^5+4x^6+8x^7+x^8}{x^4}}x^5+\right.\right.}{}$$

Optimal antiderivative

$$\left(x+\mathrm{e}^{\left(2+x-\frac{5}{x}\right)^4+3}+x^2\right)\mathrm{e}^{\frac{x}{4\ln(x)}}$$

command

```
integrate(1/4*(((16*x**8+96*x**7+32*x**6-352*x**5-1760*x**3-800*x**2+12000*x-10000)*exp((x**8
88*x**5-71*x**4+440*x**3+100*x**2-1000*x+625)/x**4)+8*x**6+4*x**5)*ln(x)**2+(x**5*exp((x**8+8
88*x**5-71*x**4+440*x**3+100*x**2-1000*x+625)/x**4)+x**7+x**6)*ln(x)-x**5*exp((x**8+8*x**7+4*
88*x**5-71*x**4+440*x**3+100*x**2-1000*x+625)/x**4)-x**7-x**6)*exp(1/4*x/ln(x))/x**5/ln(x)**2
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\left(x^2+x\right)e^{\frac{x}{4\log(x)}}+e^{\frac{x^8+8x^7+4x^6-88x^5-71x^4+440x^3+100x^2-1000x+625}{x^4}}e^{\frac{x}{4\log(x)}}$$

44.76 Problem number 5709

$$\int \frac{\left(3+12x^2\right)\log^2(x)+e^{\frac{4+4x\log(x)}{x\log(x)}}\left(-80x-80x\log(x)+60x^2\log^2(x)\right)+e^{\frac{2(4+4x\log(x))}{x\log(x)}}\left(-200x-200x\log(x)+75x^2\right.}{\log^2(x)}$$

Optimal antiderivative

$$x\left(3+\left(2+5\,\mathrm{e}^{\frac{4x^2+\frac{4x}{\ln(x)}}{x^2}}\right)^2x^2\right)$$

command

```
integrate(((75*x**2*ln(x)**2-200*x*ln(x)-200*x)*exp((4*x*ln(x)+4)/x/ln(x))**2+(60*x**2*ln(x)*
80*x*ln(x)-80*x)*exp((4*x*ln(x)+4)/x/ln(x))+(12*x**2+3)*ln(x)**2)/ln(x)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$25x^3e^{\frac{2(4x\log(x)+4)}{x\log(x)}}+20x^3e^{\frac{4x\log(x)+4}{x\log(x)}}+4x^3+3x$$

44.77 Problem number 5746

$$\int \frac{e^{\frac{x^3}{4+2x+\log(2+x)}}\left(16+16x+28x^2+19x^3+4x^4+\left(8+4x+6x^2+3x^3\right)\log(2+x)+\log^2(2+x)\right)}{16+16x+4x^2+(8+4x)\log(2+x)+\log^2(2+x)}\,dx$$

Optimal antiderivative

$$(2+x)\,\mathrm{e}^{\frac{x^3}{\ln(2+x)+2x+4}}$$

command

```
integrate((ln(2+x)**2+(3*x**3+6*x**2+4*x+8)*ln(2+x)+4*x**4+19*x**3+28*x**2+16*x+16)*exp(x**3/
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$(x+2)\,e^{\frac{x^3}{2x+\log(x+2)+4}}$$

44.78 Problem number 5929

$$\int e^{-x^2}\left(-4e^{x^2}x^3+e^{2e^{-x^2}\left(3e^{x^2}+x\right)}\left(-2e^{x^2}x-2x^2+4x^4\right)+e^{e^{-x^2}\left(3e^{x^2}+x\right)}\left(6e^{x^2}x^2+2x^3-4x^5\right)\right)\,dx$$

Optimal antiderivative

$$6-x^2\left(\mathrm{e}^{x\,\mathrm{e}^{-x^2}+3}-x\right)^2$$

command

```
integrate(((-2*exp(x**2)*x+4*x**4-2*x**2)*exp((3*exp(x**2)+x)/exp(x**2))**2+(6*x**2*exp(x**2)
4*x**5+2*x**3)*exp((3*exp(x**2)+x)/exp(x**2))-4*x**3*exp(x**2))/exp(x**2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-x^4+2x^3e^{\left(x+3e^{x^2}\right)e^{-x^2}}-x^2e^{2\left(x+3e^{x^2}\right)e^{-x^2}}$$

44.79 Problem number 5942

$$\int \frac{-8x+8x^2+\left(8x-16x^2\right)\log(x)+\frac{e^{-3+x^2}\left(-2x+2x^2+\left(6x-4x^2-8x^3\right)\log(x)\right)}{x}+\left(16x-16x\log(x)+\frac{e^{-3+x^2}\left(4x+(4-4x-8\right.}{x}}{e^{-3+x^2}\log^2(x)+4x\log^2(x}$$

Optimal antiderivative

$$\frac{2x-2\left(\ln\left(\left(4+\mathrm{e}^{-\ln(x)+x^2-3}\right)\ln(5)\right)+x\right)^2}{\ln(x)}$$

command

```
integrate(((2*exp(-ln(x)+x**2-3)+8)*ln(ln(5)*exp(-ln(x)+x**2-3)+4*ln(5))**2+(((-8*x**2-
4*x+4)*ln(x)+4*x)*exp(-ln(x)+x**2-3)-16*x*ln(x)+16*x)*ln(ln(5)*exp(-ln(x)+x**2-3)+4*ln(5))+((
8*x**3-4*x**2+6*x)*ln(x)+2*x**2-2*x)*exp(-ln(x)+x**2-3)+(-16*x**2+8*x)*ln(x)+8*x**2-
8*x)/(x*ln(x)**2*exp(-ln(x)+x**2-3)+4*x*ln(x)**2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$-\frac{4x\log\left(4\log(5)+\frac{e^{x^2-3}\log(5)}{x}\right)}{\log(x)}+\frac{-2x^2+2x}{\log(x)}-\frac{2\log\left(4\log(5)+\frac{e^{x^2-3}\log(5)}{x}\right)^2}{\log(x)}$$

44.80 Problem number 5958

$$\int \frac{\left(2e^x x^2+e^{\frac{5e^{-x}}{x}}(-10-10x)\log(18)\right)\log\left(\frac{x+e^{\frac{5e^{-x}}{x}}\log(18)}{\log(18)}\right)+\left(e^x x^2+e^{\frac{5e^{-x}}{x}+x}x\log(18)\right)\log^2\left(\frac{x+e^{\frac{5e^{-x}}{x}}\log(18)}{\log(18)}\right.}{2e^x x^2+2e^{\frac{5e^{-x}}{x}+x}x\log(18)}$$

Optimal antiderivative

$$\frac{\ln\left(\mathrm{e}^{\frac{5\,\mathrm{e}^{-x}}{x}}+\frac{x}{\ln(18)}\right)^2 x}{2}$$

command

```
integrate(((x*ln(18)*exp(x)*exp(5/exp(x)/x)+exp(x)*x**2)*ln((ln(18)*exp(5/exp(x)/x)+x)/ln(18)
10*x-10)*ln(18)*exp(5/exp(x)/x)+2*exp(x)*x**2)*ln((ln(18)*exp(5/exp(x)/x)+x)/ln(18)))/(2*x*ln
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{x \log\left(\frac{x+e^{\frac{5e^{-x}}{x}} \log(18)}{\log(18)}\right)^2}{2}$$

44.81 Problem number 5964

$$\int \frac{e\left(-30x^4-5x^5\right)+\left(x^3+30x^5+5x^6\right)\log^2(x)+\left(e\left(60x^2+10x^3\right)+\left(-x-60x^3-10x^4\right)\log^2(x)\right)\log(2x)+\left(e(-}{(30x^5+5x^6)\log^2(x)+(-60x^3-10x^4)\log^2(x)\log(2x)+}$$

Optimal antiderivative

$$\frac{\mathrm{e}}{\ln(x)}+\frac{\ln(6+x)}{5x^2-5\ln(2x)}+x$$

command

```
integrate((((5*x**2+30*x)*ln(x)**2+(-5*x-30)*exp(1))*ln(2*x)**2+((-10*x**4-60*x**3-
x)*ln(x)**2+(10*x**3+60*x**2)*exp(1))*ln(2*x)+(-2*x**3-12*x**2+x+6)*ln(x)**2*ln(6+x)+(5*x**6+
5*x**5-30*x**4)*exp(1))/((5*x**2+30*x)*ln(x)**2*ln(2*x)**2+(-10*x**4-60*x**3)*ln(x)**2*ln(2*x
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$x+\frac{e}{\log(x)}+\frac{\log(x+6)}{5x^2-5\log(x)-5\log(2)}$$

44.82 Problem number 6025

$$\int \frac{\left(\frac{16}{e^{25}}+x\right)\log\left(\frac{16}{e^{25}}+x\right)+\left(\frac{16x}{e^{25}}+x^2\right)\log(x)\log^2\left(\frac{16}{e^{25}}+x\right)+\left(-x\log(x)+\left(-\frac{16}{e^{25}}-x\right)\log(x)\log\left(\frac{16}{e^{25}}+x\right)\right)\log(lo}{\left(\frac{16x^2}{e^{25}}+x^3\right)\log(x)\log^2\left(\frac{16}{e^{25}}+x\right)}$$

Optimal antiderivative

$$\ln\left(x\,\mathrm{e}^{\frac{\ln(\ln(x))}{x\ln\left(\mathrm{e}^{4\ln(2)-25}+x\right)}}\right)$$

command

```
integrate((((-exp(4*ln(2)-25)-x)*ln(x)*ln(exp(4*ln(2)-25)+x)-x*ln(x))*ln(ln(x))+(x*exp(4*ln(2
25)+x**2)*ln(x)*ln(exp(4*ln(2)-25)+x)**2+(exp(4*ln(2)-25)+x)*ln(exp(4*ln(2)-25)+x))/(x**2*exp
25)+x**3)/ln(x)/ln(exp(4*ln(2)-25)+x)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\log(x) + \frac{\log(\log(x))}{x \log\left(x + \frac{16}{e^{25}}\right)}$$

44.83 Problem number 6249

$$\int \frac{\left(8x^2 - 50x^3 - 2x^4 - 16x^5 + 100x^6 + 4x^7\right) \log^2\left(\frac{1}{x}\right) + \left(8 - 50x - 2x^2\right) \log\left(4 - 25x - x^2\right) + \log\left(\frac{1}{x}\right) \left(-50x - 4x^2\right.}{\left(-4x^2 + 25x^3 + x^4\right) \log^2\left(\frac{1}{x}\right)}$$

Optimal antiderivative

$$x^4 - 2x - \frac{2\ln(4 - x(x+25))}{x\ln\left(\frac{1}{x}\right)}$$

command

```
integrate(((4*x**7+100*x**6-16*x**5-2*x**4-50*x**3+8*x**2)*ln(1/x)**2+((2*x**2+50*x-
8)*ln(-x**2-25*x+4)-4*x**2-50*x)*ln(1/x)+(-2*x**2-50*x+8)*ln(-x**2-25*x+4))/(x**4+25*x**3-
4*x**2)/ln(1/x)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$x^4 - 2x - \frac{2\log\left(-x^2 - 25x + 4\right)}{x\log\left(\frac{1}{x}\right)}$$

44.84 Problem number 6406

$$\int \frac{\log(x)\log^2(\log(x)) + e^{\frac{3x}{\log(\log(x))}}(-3+3\log(x)\log(\log(x)))}{\log(x)\log^2(\log(x))}\,dx$$

Optimal antiderivative

$$e^{\frac{3x}{\ln(\ln(x))}} + x$$

command

```
integrate(((3*ln(x)*ln(ln(x))-3)*exp(3/2*x/ln(ln(x)))**2+ln(x)*ln(ln(x))**2)/ln(x)/ln(ln(x))*
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$x + e^{\frac{3x}{\log(\log(x))}}$$

44.85 Problem number 6477

$$\int \frac{2x\log(x) + \left(-216x^3+216x^4-72x^5+8x^6\right)\log^3(x) + (6-2x+(6-4x)\log(x))\log\left(9-6x+x^2\right)}{\left(-27x^3+27x^4-9x^5+x^6\right)\log^3(x)}\,dx$$

Optimal antiderivative

$$\frac{\ln\left((-3+x)^2\right)}{\ln(x)^2 x^2 (-3+x)^2} + 8x$$

command

```
integrate((((6-4*x)*ln(x)+6-2*x)*ln(x**2-6*x+9)+(8*x**6-72*x**5+216*x**4-216*x**3)*ln(x)**3+2
9*x**5+27*x**4-27*x**3)/ln(x)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$8x + \frac{\log\left(x^2-6x+9\right)}{x^4\log(x)^2 - 6x^3\log(x)^2 + 9x^2\log(x)^2}$$

44.86 Problem number 6591

$$\int \frac{\left(16x-16x^2+\left(96x-48x^2+\left(-32x+16x^2\right)\log(x)\right)\log(-3+\log(x))\right)\log^3\left(-\frac{x^2\log(3)}{(-2+2x)\log(-3+\log(x))}\right)+(24x-}{(3-3x+(-1+x)\log(x))\log(-3+\log}$$

Optimal antiderivative

$$4\ln\left(\frac{x^2\ln(3)}{2\left(1-x\right)\ln(\ln(x)-3)}\right)^4 x^2$$

command

```
integrate((((8*x**2-8*x)*ln(x)-24*x**2+24*x)*ln(ln(x)-3)*ln(-x**2*ln(3)/(-2+2*x)/ln(ln(x)-
3))**4+(((16*x**2-32*x)*ln(x)-48*x**2+96*x)*ln(ln(x)-3)-16*x**2+16*x)*ln(-x**2*ln(3)/(-
2+2*x)/ln(ln(x)-3))**3)/((-1+x)*ln(x)-3*x+3)/ln(ln(x)-3),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$4x^2\log\left(-\frac{x^2\log\left(3\right)}{\left(2x-2\right)\log\left(\log\left(x\right)-3\right)}\right)^4$$

44.87 Problem number 6634

$$\int \frac{e^{\frac{-8+x-2\log(x)+10x\log(4-2x-\log(5))}{2x\log(4-2x-\log(5))}}\left(8x-x^2+(-12+6x+3\log(5))\log(4-2x-\log(5))+\log(x)(2x+(-4+2x+\ln(5))\log(4-2x-\log(5))\right)}{(-4x^2+2x^3+x^2\log(5))\log^2(4-2x-\log(5))}$$

Optimal antiderivative

$$\mathrm{e}^{4+\frac{\frac{x}{2}-\ln(x)-4}{\frac{\ln(-\ln(5)+4-2x)}{x}+x}}$$

command

```
integrate((((ln(5)+2*x-4)*ln(-ln(5)+4-2*x)+2*x)*ln(x)+(3*ln(5)+6*x-12)*ln(-ln(5)+4-
2*x)-x**2+8*x)*exp(1/2*(-2*ln(x)+10*x*ln(-ln(5)+4-2*x)-8+x)/x/ln(-ln(5)+4-2*x))/(x**2*ln(5)+2
4*x**2)/ln(-ln(5)+4-2*x)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$e^{\frac{5x\log\left(-2x-\log\left(5\right)+4\right)+\frac{x}{2}-\log\left(x\right)-4}{x\log\left(-2x-\log\left(5\right)+4\right)}}$$

44.88 Problem number 6685

$$\int \frac{2496x\log(1-2x)+(240-480x)\log^2(1-2x)+\left(-768x\log(1-2x)+(-192+384x)\log^2(1-2x)\right)\log\left(x^2\right)}{-169x^2+338x^3+\left(104x^2-208x^3\right)\log\left(x^2\right)+\left(-16x^2+32x^3\right)\log^2\left(x^2\right)}\,dx$$

Optimal antiderivative

$$\frac{16\ln(1-2x)^2}{x\left(\frac{16}{3}-\frac{4\ln(x^2)}{3}\right)-x}$$

command

```
integrate((((384*x-192)*ln(1-2*x)**2-768*x*ln(1-2*x))*ln(x**2)+(-480*x+240)*ln(1-2*x)**2+2496
2*x))/((32*x**3-16*x**2)*ln(x**2)**2+(-208*x**3+104*x**2)*ln(x**2)+338*x**3-169*x**2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$-\frac{48\log\left(1-2x\right)^2}{4x\log\left(x^2\right)-13x}$$

44.89 Problem number 6772

$$\int \frac{(-3+x)\log(3-x)+\frac{e^{e^{e^5}}+\frac{e^{e^{e^5}}\left(e^3+x\right)}{\log(3-x)}\left(-e^3x-x^2+\left(-3x+x^2\right)\log(3-x)\right)}{\log(3-x)}}{\left(-3x+x^2\right)\log(3-x)}\,dx$$

Optimal antiderivative

$$2+\mathrm{e}^{\left(\mathrm{e}^3+x\right)\mathrm{e}^{-\ln(\ln(3-x))+\mathrm{e}^{\mathrm{e}^5}}}+\ln(x)$$

command

```
integrate((((x**2-3*x)*ln(3-x)-x*exp(3)-x**2)*exp(-ln(ln(3-x))+exp(exp(5)))*exp((exp(3)+x)*ex
ln(ln(3-x))+exp(exp(5))))+(-3+x)*ln(3-x))/(x**2-3*x)/ln(3-x),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$e^{\frac{\left(x+e^3\right)e^{e^{e^5}}}{\log(3-x)}}+\log\left(x\right)$$

44.90 Problem number 6869

$$\int \frac{e^5\left(-10-2x+10x^2+2x^3\right)+e^{10}\left(10-8x-2x^2\right)\log^2(5+x)+\log\left(\frac{3e^x}{x}\right)\left(e^5\left(-10x-2x^2\right)+4e^{10}x\log(5+x)\right)}{5x+11x^2+7x^3+x^4+e^5\left(-10x-12x^2-2x^3\right)\log^2(5+x)+e^{10}\left(5x+x^2\right)\log^4(5+x)}$$

Optimal antiderivative

$$\frac{2\ln\left(\frac{\mathrm{e}^{\ln(3)+x}}{x}\right)}{(1+x)\,\mathrm{e}^{-5}-\ln(5+x)^2}$$

command

```
integrate(((4*x*exp(5)**2*ln(5+x)+(-2*x**2-10*x)*exp(5))*ln(exp(ln(3)+x)/x)+(-2*x**2-
8*x+10)*exp(5)**2*ln(5+x)**2+(2*x**3+10*x**2-2*x-10)*exp(5))/((x**2+5*x)*exp(5)**2*ln(5+x)**4
2*x**3-12*x**2-10*x)*exp(5)*ln(5+x)**2+x**4+7*x**3+11*x**2+5*x),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{2e^5\log\left(\frac{3e^x}{x}\right)}{x-e^5\log\left(x+5\right)^2+1}$$

44.91 Problem number 7164

$$\int \frac{\left(-20x+e^{3+2x}\left(16x+16x^2+4x^3\right)\right)\log(x)\log\left(\frac{-5x+e^{3+2x}(2+x)}{2+x}\right)+\left(20x+10x^2+e^{3+2x}\left(-8-8x-2x^2\right)+(-10\right.}{\left(-10x-5x^2+e^{3+2x}\left(4+4x+x^2\right)\right)\log^3(x)}$$

Optimal antiderivative

$$\frac{x\ln\left(\mathrm{e}^{3+2x}-\frac{5x}{2+x}\right)^2}{\ln(x)^2}$$

command

```
integrate(((((x**2+4*x+4)*exp(3+2*x)-5*x**2-10*x)*ln(x)+(-2*x**2-8*x-8)*exp(3+2*x)+10*x**2+20
5*x)/(2+x))**2+((4*x**3+16*x**2+16*x)*exp(3+2*x)-20*x)*ln(x)*ln(((2+x)*exp(3+2*x)-
5*x)/(2+x)))/((x**2+4*x+4)*exp(3+2*x)-5*x**2-10*x)/ln(x)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{x\log\left(\frac{-5x+(x+2)e^{2x+3}}{x+2}\right)^2}{\log\left(x\right)^2}$$

44.92 Problem number 7254

$$\int \frac{\left(7x+14e^{2x}x\right)\log\left(-\frac{10}{x}\right)+\left(-7e^{2x}-7x+\left(-7e^{2x}x-7x^2\right)\log\left(-\frac{10}{x}\right)\right)\log\left(e^{2x}+x\right)}{3e^{3x}x+3e^{x}x^2}\,dx$$

Optimal antiderivative

$$\frac{7\ln\left(\mathrm{e}^{2x}+x\right)\ln\left(-\frac{10}{x}\right)\mathrm{e}^{-x}}{3}$$

command

```
integrate((((-7*x*exp(x)**2-7*x**2)*ln(-10/x)-7*exp(x)**2-7*x)*ln(exp(x)**2+x)+(14*x*exp(x)**
10/x))/(3*x*exp(x)**3+3*exp(x)*x**2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\frac{7e^{-x}\log\left(-\frac{10}{x}\right)\log\left(x+e^{2x}\right)}{3}$$

44.93 Problem number 7265

$$\int \frac{9x+12x^2+18x^3-6x^4-6x^2\log(x)+\left(24x^2-12x^4-12x^2\log(x)+\left(-36x+18x^3+18x\log(x)\right)\log\left(-2+x^2\right.\right.}{4x-2x^3-2x\log(x)+\left(-6+3x^2+3\log(x)\right)\log\left(-2+x^2+\log(\right.}$$

Optimal antiderivative

$$3x^2\ln\left(3\ln\left(\ln(x)+x^2-2\right)-2x\right)$$

command

```
integrate((((18*x*ln(x)+18*x**3-36*x)*ln(ln(x)+x**2-2)-12*x**2*ln(x)-12*x**4+24*x**2)*ln(3*ln
2)-2*x)-6*x**2*ln(x)-6*x**4+18*x**3+12*x**2+9*x)/((3*ln(x)+3*x**2-6)*ln(ln(x)+x**2-
2)-2*x*ln(x)-2*x**3+4*x),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$3x^2\log\left(-2x+3\log\left(x^2+\log\left(x\right)-2\right)\right)$$

44.94 Problem number 7310

$$\int \frac{-108+144x^3+2x^6+e^{-1+x}\left(-54+72x^3+x^6\right)+\left(e^{-1+x}\left(9x-24x^4+16x^7\right)+e^{-1+x}x^7\log(x)\right)\log\left(\frac{9-24x^3+16}{}\right.}{9x-24x^4+16x^7+x^7\log(x)}$$

Optimal antiderivative

$$\ln\left(\ln(x)+\left(4-\frac{3}{x^3}\right)^2\right)\left(2+\mathrm{e}^{-1+x}\right)$$

command

```
integrate(((x**7*exp(-1+x)*ln(x)+(16*x**7-24*x**4+9*x)*exp(-1+x))*ln((x**6*ln(x)+16*x**6-
24*x**3+9)/x**6)+(x**6+72*x**3-54)*exp(-1+x)+2*x**6+144*x**3-108)/(x**7*ln(x)+16*x**7-
24*x**4+9*x),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$e^{x-1}\log\left(\frac{x^6\log(x)+16x^6-24x^3+9}{x^6}\right)+2\log\left(\log(x)+\frac{16x^6-24x^3+9}{x^6}\right)$$

44.95 Problem number 7313

$$\int \frac{e^{\frac{20+5x+x\log(x)+5\log^2(x)}{4+x+\log^2(x)}}\left(-128-56x-6x^2+8x\log(x)+(-64-18x)\log^2(x)+2x\log^3(x)-8\log^4(x)\right)}{16x^5+8x^6+x^7+\left(8x^5+2x^6\right)\log^2(x)+x^5\log^4(x)}\,dx$$

Optimal antiderivative

$$\frac{2\,\mathrm{e}^{\frac{x}{\frac{4+x}{\ln(x)}+\ln(x)}+5}}{x^4}$$

command

```
integrate((-8*ln(x)**4+2*x*ln(x)**3+(-18*x-64)*ln(x)**2+8*x*ln(x)-6*x**2-56*x-128)*exp((5*ln(
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{2e^{\frac{x\log(x)+5x+5\log(x)^2+20}{x+\log(x)^2+4}}}{x^4}$$

44.96 Problem number 7350

$$\int \frac{\left(\left(-320-16x-1280x^2-64x^3\right)\log\left(\frac{20+x}{4}\right)+\left(1280x^2+64x^3\right)\log\left(x^2\right)\log\left(\frac{20+x}{4}\right)\right)\log\left(\frac{16+64x^2}{\log(x^2)}\right)+\left(-4x-16x\right.}{\left(20x+x^2+80x^3+4x^4\right)\log\left(x^2\right)\log^2\left(\frac{20+x}{4}\right)}$$

Optimal antiderivative

$$\frac{4\ln\left(\frac{64x^2+16}{\ln(x^2)}\right)^2}{\ln\left(5+\frac{x}{4}\right)}$$

command

```
integrate(((-16*x**3-4*x)*ln(x**2)*ln((64*x**2+16)/ln(x**2))**2+((64*x**3+1280*x**2)*ln(5+1/4
64*x**3-1280*x**2-16*x-320)*ln(5+1/4*x))*ln((64*x**2+16)/ln(x**2)))/(4*x**4+80*x**3+x**2+20*x
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{4\log\left(\frac{64x^2+16}{\log\left(x^2\right)}\right)^2}{\log\left(\frac{x}{4}+5\right)}$$

44.97 Problem number 7422

$$\int \frac{e^{\frac{12}{(-15+20x)\log\left(x\log^2(2)\right)}}\left(72-96x-96x\log\left(x\log^2(2)\right)\right)}{\left(45x-120x^2+80x^3\right)\log^2\left(x\log^2(2)\right)}\,dx$$

Optimal antiderivative

$$2\,e^{\frac{3}{5\ln\left(x\ln(2)^2\right)\left(x-\frac{3}{4}\right)}}-5$$

command

```
integrate((-96*x*ln(x*ln(2)**2)-96*x+72)*exp(12/(20*x-15)/ln(x*ln(2)**2))/(80*x**3-
120*x**2+45*x)/ln(x*ln(2)**2)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$2e^{\frac{12}{(20x-15)\log\left(x\log(2)^2\right)}}$$

44.98 Problem number 7508

$$\int \frac{\left(-8x+12x^2+72x^3+32x^4\right)\log(x)+\left(64-216x-148x^2-44x^3-16x^4+\left(224x+284x^2+60x^3+32x^4\right)\log(\right.}{\left(8x+x^2+x^3\right)\log^2(x)}$$

Optimal antiderivative

$$\frac{4(2+x)\ln\left(x^2+x+8\right)(-1+4x)}{\ln(x)}$$

command

```
integrate((((32*x**4+60*x**3+284*x**2+224*x)*ln(x)-16*x**4-44*x**3-148*x**2-216*x+64)*ln(x**2
8*x)*ln(x))/(x**3+x**2+8*x)/ln(x)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{\left(16x^2+28x-8\right)\log\left(x^2+x+8\right)}{\log(x)}$$

44.99 Problem number 7742

$$\int \frac{e^{\frac{x-x^3\log(x)}{\log^2(x)}}\left(2+\left(-1-x^2\right)\log(x)+3x^2\log^2(x)\right)}{\log^3(x)}\,dx$$

Optimal antiderivative

$$\mathrm{e}^{4-\mathrm{e}^4}+9-\mathrm{e}^{\frac{\frac{x}{\ln(x)}-x^3}{\ln(x)}}$$

command

```
integrate((3*x**2*ln(x)**2+(-x**2-1)*ln(x)+2)*exp((-x**3*ln(x)+x)/ln(x)**2)/ln(x)**3,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$-e^{\frac{-x^3\log(x)+x}{\log(x)^2}}$$

44.100 Problem number 7758

$$\int \frac{e^{\frac{-e+\log(3)}{-20-x+x\log(x)}}(e-\log(3))\log(x)}{400+40x+x^2+(-40x-2x^2)\log(x)+x^2\log^2(x)}\,dx$$

Optimal antiderivative

$$\mathrm{e}^{\frac{-\ln(3)+\mathrm{e}}{20+x-x\ln(x)}}$$

command

```
integrate((-ln(3)+exp(1))*ln(x)*exp((ln(3)-exp(1))/(x*ln(x)-x-20))/(x**2*ln(x)**2+(-
2*x**2-40*x)*ln(x)+x**2+40*x+400),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$e^{\frac{-e+\log(3)}{x\log(x)-x-20}}$$

44.101 Problem number 7785

$$\int \frac{e^{-4x^2}\left(e^{4x^2}\log^2(x)+e^{\frac{e^{-4x^2}x}{\log(x)}}\left(31+5x+\left(-31-5x+248x^2+40x^3\right)\log(x)-5e^{4x^2}\log^2(x)\right)\right)}{\log^2(x)}\,dx$$

Optimal antiderivative

$$x+\mathrm{e}^{\frac{x\,\mathrm{e}^{-4x^2}}{\ln(x)}}(-31-5x)$$

command

```
integrate(((-5*exp(4*x**2)*ln(x)**2+(40*x**3+248*x**2-5*x-31)*ln(x)+5*x+31)*exp(x/exp(4*x**2)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: SystemError

Sympy 1.8 under Python 3.8.8 output

$$x+(-5x-31)\,e^{\frac{xe^{-4x^2}}{\log(x)}}$$

44.102 Problem number 7935

$$\int \frac{e^2\left(2x+2x^2\right)+e\left(52x+4x^2\right)\log(x)+\left(50x+2x^2\right)\log^2(x)+\left(e(96+48x)+e^2\left(2x+x^2\right)+e\left(4x+2x^2\right)\log(x)\right.}{e^2\left(2x+x^2\right)+e\left(4x+2x^2\right)\log(x)+\left(2x+x^2\right)\log^2(x)}$$

Optimal antiderivative

$$x-\ln(2+x)\left(-x-\frac{48\ln(x)}{\mathrm{e}+\ln(x)}\right)$$

command

```
integrate((((x**2+2*x)*ln(x)**2+(2*x**2+4*x)*exp(1)*ln(x)+(x**2+2*x)*exp(1)**2+(48*x+96)*exp(
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$x+48\log(x+2)+\frac{(x\log(x)+ex-48e)\log(x+2)}{\log(x)+e}$$

44.103 Problem number 8068

$$\int \frac{e^x\left(10x^3-10x^4+e^3\left(-10x^2+10x^3\right)\right)+e^x\left(20e^3x^2-20x^3\right)\log\left(e^3-\right.}{9x^5-18x^6+9x^7+e^3\left(-9x^4+18x^5-9x^6\right)+e^x\left(-5x^5+10x^6-5x^7+e^3\left(5x^4-10x^5+5x^6\right)\right)+\left(-36x^5+36x\right.}$$

Optimal antiderivative

$$\frac{\ln(5\,\mathrm{e}^x-9)}{x\left(\frac{\left(\ln(-x+\mathrm{e}^3)+x\right)^2}{2}-\frac{x}{2}\right)}$$

command

```
integrate(((((-10*exp(3)+10*x)*exp(x)+18*exp(3)-18*x)*ln(-x+exp(3))**2+((-40*x*exp(3)+40*x**2
72*x**2-36*x)*ln(-x+exp(3))+((-30*x**2+20*x)*exp(3)+30*x**3)*exp(x)+(54*x**2-36*x)*exp(3)-
54*x**3)*ln(5*exp(x)-9)+(10*x*exp(3)-10*x**2)*exp(x)*ln(-x+exp(3))**2+(20*x**2*exp(3)-
20*x**3)*exp(x)*ln(-x+exp(3))+((10*x**3-10*x**2)*exp(3)-10*x**4+10*x**3)*exp(x))/(((5*x**2*ex
5*x**3)*exp(x)-9*x**2*exp(3)+9*x**3)*ln(-x+exp(3))**4+((20*x**3*exp(3)-20*x**4)*exp(x)-
36*x**3*exp(3)+36*x**4)*ln(-x+exp(3))**3+(((30*x**4-10*x**3)*exp(3)-30*x**5+10*x**4)*exp(x)+(
54*x**4+18*x**3)*exp(3)+54*x**5-18*x**4)*ln(-x+exp(3))**2+(((20*x**5-20*x**4)*exp(3)-
20*x**6+20*x**5)*exp(x)+(-36*x**5+36*x**4)*exp(3)+36*x**6-36*x**5)*ln(-x+exp(3))+((5*x**6-
10*x**5+5*x**4)*exp(3)-5*x**7+10*x**6-5*x**5)*exp(x)+(-9*x**6+18*x**5-9*x**4)*exp(3)+9*x**7-
18*x**6+9*x**5),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{2\log(5e^x-9)}{x^3+2x^2\log(-x+e^3)-x^2+x\log(-x+e^3)^2}$$

44.104 Problem number 8168

$$\int \frac{(-6x+3\log(4))\log\left(\frac{x}{2}\right)+\left(-2x^2+x\log(4)\right)\log^2\left(\frac{x}{2}\right)+\left(3x-3\log(4)+\left(-x^2+x\log(4)\right)\log^2\left(\frac{x}{2}\right)\right)\log\left(-x^2+\right.}{\left(-x^2+x\log(4)\right)\log^2\left(\frac{x}{2}\right)}$$

Optimal antiderivative

$$\ln(x(2\ln(2)-x))\left(\frac{3}{\ln\left(\frac{x}{2}\right)}+x\right)$$

command

```
integrate((((2*x*ln(2)-x**2)*ln(1/2*x)**2-6*ln(2)+3*x)*ln(2*x*ln(2)-x**2)+(2*x*ln(2)-
2*x**2)*ln(1/2*x)**2+(6*ln(2)-6*x)*ln(1/2*x))/(2*x*ln(2)-x**2)/ln(1/2*x)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{\left(x\log\left(\frac{x}{2}\right)+3\right)\log\left(-x^2+2x\log\left(2\right)\right)}{\log\left(\frac{x}{2}\right)}$$

44.105 Problem number 8246

$$\int \frac{\left(486x-324x^2-108x^3+144x^4-42x^5+4x^6+e^x\left(-162x+216x^2-108x^3+24x^4-2x^5\right)+\left(324-108x-21\right.\right.}{}$$

Optimal antiderivative

$$(3-x)^4\ln\left(e^x+\ln(5)-(x+\ln(x))^2-x\right)^2e^{-2x}$$

command

```
integrate((((-2*x**5+28*x**4-144*x**3+324*x**2-270*x)*ln(x)**2+(-4*x**6+56*x**5-288*x**4+648*
540*x**2)*ln(x)+(2*x**5-28*x**4+144*x**3-324*x**2+270*x)*exp(x)+(2*x**5-28*x**4+144*x**3-
324*x**2+270*x)*ln(5)-2*x**7+26*x**6-116*x**5+180*x**4+54*x**3-270*x**2)*ln(-ln(x)**2-
2*x*ln(x)+exp(x)+ln(5)-x**2-x)**2+((4*x**5-44*x**4+168*x**3-216*x**2-108*x+324)*ln(x)+(-
2*x**5+24*x**4-108*x**3+216*x**2-162*x)*exp(x)+4*x**6-42*x**5+144*x**4-108*x**3-324*x**2+486*
ln(x)**2-2*x*ln(x)+exp(x)+ln(5)-x**2-x))/(x*exp(x)**2*ln(x)**2+2*x**2*exp(x)**2*ln(x)-
x*exp(x)**3+(-x*ln(5)+x**3+x**2)*exp(x)**2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$\left(x^4-12x^3+54x^2-108x+81\right)e^{-2x}\log\left(-x^2-2x\log\left(x\right)-x+e^x-\log\left(x\right)^2+\log\left(5\right)\right)^2$$

44.106 Problem number 8247

$$\int \frac{(1+9x)\log(x)+(-22-9x-\log(x))\log\left(\frac{1}{2}(22+9x+\log(x))\right)}{(22x+9x^2)\log^2(x)+x\log^3(x)}\,dx$$

Optimal antiderivative

$$\frac{\ln\left(\frac{\ln(x)}{2}+\frac{9x}{2}+11\right)}{\ln(x)}+4$$

command

```
integrate(((-ln(x)-9*x-22)*ln(1/2*ln(x)+9/2*x+11)+(9*x+1)*ln(x))/(x*ln(x)**3+(9*x**2+22*x)*ln
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{\log\left(\frac{9x}{2}+\frac{\log(x)}{2}+11\right)}{\log(x)}$$

44.107 Problem number 8305

$$\int \frac{e^{\frac{9x}{6+e^3+\log\left(\frac{5}{3}\right)+3\log(x)}+\frac{9x}{6+e^3+\log\left(\frac{5}{3}\right)+3\log(x)}}\left(27+9e^3+9\log\left(\frac{5}{3}\right)+27\log(x)\right)}{36+12e^3+e^6-(-12-2e^3)\log\left(\frac{5}{3}\right)+\log^2\left(\frac{5}{3}\right)+\left(36+6e^3+6\log\left(\frac{5}{3}\right)\right)\log(x)+9\log^2(x)}\,dx$$

Optimal antiderivative

$$e^{e^{\frac{3x}{\ln(x)+2-\frac{\ln\left(\frac{3}{5}\right)}{3}+\frac{e^3}{3}}}}$$

command

```
integrate((27*ln(x)-9*ln(3/5)+9*exp(3)+27)*exp(9*x/(3*ln(x)-ln(3/5)+exp(3)+6))*exp(exp(9*x/(3
ln(3/5)+exp(3)+6)))/(9*ln(x)**2+(-6*ln(3/5)+6*exp(3)+36)*ln(x)+ln(3/5)**2+(-2*exp(3)-
12)*ln(3/5)+exp(3)**2+12*exp(3)+36),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$e^{e^{\frac{9x}{3\log(x)-\log\left(\frac{3}{5}\right)+6+e^3}}}$$

44.108 Problem number 8314

$$\int \frac{\left(-16x+28x^2-8x^3\right)\log(x)+\left(8x-4x^2+\left(8x-28x^2+12x^3\right)\log(x)\right)\log\left(e^{-2x}\left(-2x^2+x^3\right)\right)+\left(-16x+8x^2\right)}{(-2+x)\log(x)\log\left(e^{-2x}\left(-2x^2+x^3\right)\right)}$$

Optimal antiderivative

$$4x^2\left(x+\ln\left(\frac{\ln\left(x^2\mathrm{e}^{-2x}(-2+x)\right)}{x\ln(x)}\right)\right)$$

command

```
integrate(((8*x**2-16*x)*ln(x)*ln((x**3-2*x**2)/exp(x)**2)*ln(ln((x**3-2*x**2)/exp(x)**2)/x/l
28*x**2+8*x)*ln(x)-4*x**2+8*x)*ln((x**3-2*x**2)/exp(x)**2)+(-8*x**3+28*x**2-16*x)*ln(x))/(-
2+x)/ln(x)/ln((x**3-2*x**2)/exp(x)**2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$4x^3+\left(4x^2-\frac{8}{3}\right)\log\left(\frac{\log\left(\left(x^3-2x^2\right)e^{-2x}\right)}{x\log(x)}\right)-\frac{8\log(x)}{3}$$
$$-\frac{8\log(\log(x))}{3}+\frac{8\log\left(\log\left(\left(x^3-2x^2\right)e^{-2x}\right)\right)}{3}$$

44.109 Problem number 8325

$$\int \frac{\left(600-160x-136x^2-16x^3\right)\log^2(2x)+e^{\frac{x}{(40+8x)\log(2x)}}\left(-5x-x^2+5x\log(2x)+\left(200+80x+8x^2\right)\log^2(2x)\right)}{\left(200+80x+8x^2\right)\log^2(2x)}\,dx$$

Optimal antiderivative

$$\left(3+\mathrm{e}^{\frac{x}{8(5+x)\ln(2x)}}-x\right)x$$

command

```
integrate((((8*x**2+80*x+200)*ln(2*x)**2+5*x*ln(2*x)-x**2-5*x)*exp(x/(8*x+40)/ln(2*x))+(-
16*x**3-136*x**2-160*x+600)*ln(2*x)**2)/(8*x**2+80*x+200)/ln(2*x)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$-x^2+xe^{\frac{x}{(8x+40)\log(2x)}}+3x$$

44.110 Problem number 8348

$$\int e^{\frac{50}{x}+2x}\left(2400x^6-384x^7-96x^8\right)\,dx$$

Optimal antiderivative

$$-2-48x^8\mathrm{e}^{2x}\mathrm{e}^{\frac{50}{x}}$$

command

```
integrate((-96*x**8-384*x**7+2400*x**6)*exp(25/x)**2*exp(x)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-48x^8e^{\frac{50}{x}}e^{2x}$$

44.111 Problem number 8392

$$\int \frac{-720+540x+3e^{4+x}x^3+\left(180x-6e^{4+x}x^2\right)\log\left(\frac{x}{\log(5)}\right)+3e^{4+x}x\log^2\left(\frac{x}{\log(5)}\right)+\left(-720x-180x^2+3e^{4+x}x^2+\right.}{-240x-60x^2+e^{4+x}x^2+(240+60x-2e^{4+x}x}$$

Optimal antiderivative

$$3\ln\left(\frac{60+15x}{\frac{x}{4}-\frac{\ln\left(\frac{x}{\ln(5)}\right)}{4}}-\mathrm{e}^{4+x}\right)x$$

command

```
integrate(((3*exp(4+x)*ln(x/ln(5))**2+(-6*x*exp(4+x)+180*x+720)*ln(x/ln(5))+3*x**2*exp(4+x)-
180*x**2-720*x)*ln((-exp(4+x)*ln(x/ln(5))+x*exp(4+x)-60*x-240)/(ln(x/ln(5))-x))+3*x*exp(4+x)*
6*x**2*exp(4+x)+180*x)*ln(x/ln(5))+3*x**3*exp(4+x)+540*x-720)/(exp(4+x)*ln(x/ln(5))**2+(-
2*x*exp(4+x)+60*x+240)*ln(x/ln(5))+x**2*exp(4+x)-60*x**2-240*x),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$3x\log\left(\frac{xe^{x+4}-60x-e^{x+4}\log\left(\frac{x}{\log(5)}\right)-240}{-x+\log\left(\frac{x}{\log(5)}\right)}\right)$$

44.112 Problem number 8435

$$\int \frac{75+90x+3x^2+\left(120x-24x^2+\left(75-30x+3x^2\right)\log\left(\frac{x}{e}\right)\right)\log\left(\frac{-8x+(-5+x)\log\left(\frac{x}{e}\right)}{-5+x}\right)\log\left(-\log\left(\frac{-8x+(-5+x)\log(}{-5+x}\right.\right.}{\left(40x-8x^2+\left(25-10x+x^2\right)\log\left(\frac{x}{e}\right)\right)\log\left(\frac{-8x+(-5+x)\log\left(\frac{x}{e}\right)}{-5+x}\right)}$$

Optimal antiderivative

$$3x\ln\left(-\ln\left(\ln\left(\mathrm{e}^{-1}x\right)+\frac{8x}{5-x}\right)\right)$$

command

```
integrate((((3*x**2-30*x+75)*ln(x/exp(1))-24*x**2+120*x)*ln(((-5+x)*ln(x/exp(1))-8*x)/(-
5+x))*ln(-ln(((-5+x)*ln(x/exp(1))-8*x)/(-5+x)))+3*x**2+90*x+75)/((x**2-10*x+25)*ln(x/exp(1))-
8*x**2+40*x)/ln(((-5+x)*ln(x/exp(1))-8*x)/(-5+x)),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\left(3x-\frac{5}{2}\right)\log\left(-\log\left(\frac{-8x+(x-5)\log\left(\frac{x}{e}\right)}{x-5}\right)\right)+\frac{5\log\left(\log\left(\frac{-8x+(x-5)\log\left(\frac{x}{e}\right)}{x-5}\right)\right)}{2}$$

44.113 Problem number 8519

$$\int \frac{4x-x^2+e^x\left(-4x+x^2\right)+e^{e^x}\left(-x^2+e^{2x}\left(-4x+x^2\right)+e^x\left(x+4x^2-x^3\right)\right)+\left(-2e^x+2x\right)\log\left(\frac{x}{5}\right)+\left(e^x x-x^2\right)}{e^x x-x^2}$$

Optimal antiderivative

$$(-4+x)\left(\mathrm{e}^{e^x}+\ln(x-\mathrm{e}^x)\right)-\ln\left(\frac{x}{5}\right)^2$$

command

```
integrate(((exp(x)*x-x**2)*ln(x-exp(x))+((x**2-4*x)*exp(x)**2+(-x**3+4*x**2+x)*exp(x)-
x**2)*exp(exp(x))+(-2*exp(x)+2*x)*ln(1/5*x)+(x**2-4*x)*exp(x)-x**2+4*x)/(exp(x)*x-
x**2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$x\log\left(x-e^x\right)+\left(x-4\right)e^{e^x}-\log\left(\frac{x}{5}\right)^2-4\log\left(-x+e^x\right)$$

44.114 Problem number 8523

$$\int \frac{\left(80-40x-2x^2+x^3\right)\log(-2+x)+e^{3e^x+x}\left(-60x^2+30x^3\right)\log(-2+x)+\left(-40x-10e^{3e^x}x^2-x^3\right)\log\left(\frac{40+10e}{}\right.}{e^{3e^x}\left(-20x^2+10x^3\right)\log^2(-2+x)+\left(-80x+40x^2-2x^3+x^4\right)\log^2(-2+x)}$$

Optimal antiderivative

$$\frac{\ln\left(10\,\mathrm{e}^{3\,\mathrm{e}^x}+\frac{40}{x}+x\right)}{\ln(-2+x)}-5$$

command

```
integrate(((-10*x**2*exp(3*exp(x))-x**3-40*x)*ln((10*x*exp(3*exp(x))+x**2+40)/x)+(30*x**3-
60*x**2)*exp(x)*ln(-2+x)*exp(3*exp(x))+(x**3-2*x**2-40*x+80)*ln(-2+x))/((10*x**3-20*x**2)*ln(
2+x)**2*exp(3*exp(x))+(x**4-2*x**3+40*x**2-80*x)*ln(-2+x)**2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{\log\left(\frac{x^2+10xe^{3e^x}+40}{x}\right)}{\log(x-2)}$$

44.115 Problem number 8610

$$\int \frac{36x^3+12x^4+\left(-36x^3-9x^4\right)\log(x)+\left(-18-9x-x^2\right)\log^2(5)\log^3(x)+\left(-18x^3-6x^4+\left(18x^3+6x^4\right)\log(x)\right.}{\left(3x^2+x^3\right)\log^2(5)\log^3(x)}$$

Optimal antiderivative

$$\frac{\left(\frac{3x^3}{\ln(5)^2\ln(x)^2}-3-x\right)\left(\ln(3+x)-2\right)}{x}$$

command

```
integrate((((3*x+9)*ln(5)**2*ln(x)**3+(6*x**4+18*x**3)*ln(x)-6*x**4-18*x**3)*ln(3+x)+(-
x**2-9*x-18)*ln(5)**2*ln(x)**3+(-9*x**4-36*x**3)*ln(x)+12*x**4+36*x**3)/(x**3+3*x**2)/ln(5)**
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$-\frac{6x^2}{\log(5)^2\log(x)^2}-\log(x+3)+\frac{\left(3x^3-3\log(5)^2\log(x)^2\right)\log(x+3)}{x\log(5)^2\log(x)^2}+\frac{6}{x}$$

44.116 Problem number 8617

$$\int \frac{\left(6x+12x^2+4x^3\right)\log^2(3x)+e^{\frac{2\left(-x^2+x^3\right)}{\log(3x)}}\left(6x^2+2x^3-6x^4-2x^5+\left(-12x^2+2x^3+20x^4+6x^5\right)\log(3x)+(3+\right.}{\log^2(3x)}$$

Optimal antiderivative

$$\left(x^2+x\,\mathrm{e}^{\frac{2x\left(x^2-x\right)}{\ln(3x)}}\right)\left((2+x)^2-1\right)$$

command

```
integrate((((3*x**2+8*x+3)*ln(3*x)**2+(6*x**5+20*x**4+2*x**3-12*x**2)*ln(3*x)-2*x**5-
6*x**4+2*x**3+6*x**2)*exp((x**3-x**2)/ln(3*x))**2+(4*x**3+12*x**2+6*x)*ln(3*x)**2)/ln(3*x)**2
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$x^4+4x^3+3x^2+\left(x^3+4x^2+3x\right)e^{\frac{2\left(x^3-x^2\right)}{\log(3x)}}$$

44.117 Problem number 8620

$$\int \frac{e^{-\frac{5}{x^4\log\left(-3x+2x^5\right)}}\left(-45+150x^4+\left(-180+120x^4\right)\log\left(-3x+2x^5\right)\right)}{\left(-3x^5+2x^9\right)\log^2\left(-3x+2x^5\right)}\,dx$$

Optimal antiderivative

$$3\,\mathrm{e}^{-\frac{5}{x^4\ln\left(2x\left(x^4-2\right)+x\right)}}$$

command

```
integrate(((120*x**4-180)*ln(2*x**5-3*x)+150*x**4-45)/(2*x**9-3*x**5)/ln(2*x**5-3*x)**2/exp(5
3*x)),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$3e^{-\frac{5}{x^4\log\left(2x^5-3x\right)}}$$

44.118 Problem number 8793

$$\int \frac{x\log(4)+\log^2(4)+e^x\left(-x^2\log(4)-x\log^2(4)\right)+\left(-x\log(4)+\log^2(4)+e^x\left(x^3\log(4)+x^2\log^2(4)\right)\right)\log\left(\frac{x}{4}\right)+(}{\left(x^3+x^2\log(4)\right)\log^2\left(\frac{x}{4}\right)}$$

Optimal antiderivative

$$\frac{2\ln(2)\left(\mathrm{e}^x-\frac{\ln\left((x+2\ln(2))^2\right)+1}{x}\right)}{\ln\left(\frac{x}{4}\right)}$$

command

```
integrate((((4*ln(2)**2+2*x*ln(2))*ln(1/4*x)+4*ln(2)**2+2*x*ln(2))*ln(4*ln(2)**2+4*x*ln(2)+x*
2*x*ln(2))*ln(1/4*x)+(-4*x*ln(2)**2-2*x**2*ln(2))*exp(x)+4*ln(2)**2+2*x*ln(2))/(2*x**2*ln(2)+
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{2e^x\log(2)}{\log\left(\frac{x}{4}\right)}-\frac{2\log(2)\log\left(x^2+4x\log(2)+4\log(2)^2\right)}{x\log\left(\frac{x}{4}\right)}-\frac{2\log(2)}{x\log\left(\frac{x}{4}\right)}$$

44.119 Problem number 8800

$$\int \frac{-4\log(5)\log^2\left(\frac{16}{x^2}\right)+e^{\frac{x}{\log\left(\frac{16}{x^2}\right)}}\left(8x-8x^2+\left(4x-4x^2\right)\log\left(\frac{16}{x^2}\right)-4\log^2\left(\frac{16}{x^2}\right)\right)}{3x^2\log^2\left(\frac{16}{x^2}\right)}\,dx$$

Optimal antiderivative

$$\frac{\left(\mathrm{e}^{\frac{x}{\ln\left(\frac{16}{x^2}\right)}}+\ln(5)\right)(4-4x)}{3x}$$

command

```
integrate(1/3*((-4*ln(16/x**2)**2+(-4*x**2+4*x)*ln(16/x**2)-8*x**2+8*x)*exp(x/ln(16/x**2))-
4*ln(5)*ln(16/x**2)**2)/x**2/ln(16/x**2)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{(4-4x)\,e^{\frac{x}{\log\left(\frac{16}{x^2}\right)}}}{3x}+\frac{4\log(5)}{3x}$$

44.120 Problem number 8869

$$\int \frac{e^{\frac{1}{-400x^5+\left(2000x^4+400x^5\right)\log(x)}}(-5+4x+(-20-5x)\log(x))}{200x^7+(-2000x^6-400x^7)\log(x)+(5000x^5+2000x^6+200x^7)\log^2(x)}\,dx$$

Optimal antiderivative

$$2\,\mathrm{e}^{-\frac{1}{400x^4(x+(-x-5)\ln(x))}}$$

command

```
integrate(((-5*x-20)*ln(x)+4*x-5)/((200*x**7+2000*x**6+5000*x**5)*ln(x)**2+(-400*x**7-
2000*x**6)*ln(x)+200*x**7)/exp(-1/((400*x**5+2000*x**4)*ln(x)-400*x**5)),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$2e^{\frac{1}{-400x^5+\left(400x^5+2000x^4\right)\log(x)}}$$

44.121 Problem number 8893

$$\int \frac{4e^5x^2\log^2(x)+e^{\frac{3}{e^5x^2\log(x)}}\log\left(2+e^2\right)\left(6+12\log(x)-4e^5x^2\log^2(x)\right)+e^{\frac{6}{e^5x^2\log(x)}}\log^2\left(2+e^2\right)\left(-3-6\log(x)+\right.}{2e^5x\log^2\left(2+e^2\right)\log^2(x)}$$

Optimal antiderivative

$$\left(\frac{x}{\ln(\mathrm{e}^2+2)}-\frac{x\,\mathrm{e}^{\frac{3\,\mathrm{e}^{-5}}{x^2\ln(x)}}}{2}\right)^2$$

command

```
integrate(1/2*((x**2*exp(5)*ln(x)**2-6*ln(x)-3)*ln(exp(2)+2)**2*exp(3/x**2/exp(5)/ln(x))**2+(
4*x**2*exp(5)*ln(x)**2+12*ln(x)+6)*ln(exp(2)+2)*exp(3/x**2/exp(5)/ln(x))+4*x**2*exp(5)*ln(x)*
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{x^2}{\log\left(2+e^2\right)^2}+\frac{x^2e^{\frac{6}{x^2e^5\log(x)}}\log\left(2+e^2\right)-4x^2e^{\frac{3}{x^2e^5\log(x)}}}{4\log\left(2+e^2\right)}$$

44.122 Problem number 8900

$$\int \frac{e^{\frac{x}{2+\log(-18-2x+\log(4)+3\log(25))}}(-36-2x+2\log(4)+6\log(25)+(-18-2x+\log(4)+3\log(25))\log(-18-2x+\log(4)+3\log(25))+(-1}{-72-8x+4\log(4)+12\log(25)+(-72-8x+4\log(4)+12\log(25))\log(-18-2x+\log(4)+3\log(25))+(-1}$$

Optimal antiderivative

$$e^{\frac{x}{\ln(6\ln(5)+2\ln(2)-2x-18)+2}}$$

command

```
integrate(((6*ln(5)+2*ln(2)-2*x-18)*ln(6*ln(5)+2*ln(2)-2*x-18)+12*ln(5)+4*ln(2)-2*x-
36)*exp(x/(ln(6*ln(5)+2*ln(2)-2*x-18)+2))/((6*ln(5)+2*ln(2)-2*x-18)*ln(6*ln(5)+2*ln(2)-
2*x-18)**2+(24*ln(5)+8*ln(2)-8*x-72)*ln(6*ln(5)+2*ln(2)-2*x-18)+24*ln(5)+8*ln(2)-8*x-
72),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$e^{\frac{x}{\log(-2x-18+2\log(2)+6\log(5))+2}}$$

44.123 Problem number 9001

$$\int \frac{e^{\frac{2x}{\log(x)}}\left(-2x^2+2x^2\log(x)+2x\log^2(x)+e^{-30+2x-2x\log(2x)}\left(-2+2\log(x)-2\log^2(x)\log(2x)\right)+e^{-15+x-x\log(2x)}\right.}{5\log^2(x)}$$

Optimal antiderivative

$$\frac{e^{\frac{2x}{\ln(x)}}\left(x-e^{-x\ln(2x)+x-15}\right)^2}{5}$$

command

```
integrate(1/5*((-2*ln(x)**2*ln(2*x)+2*ln(x)-2)*exp(-x*ln(2*x)+x-15)**2+(2*x*ln(x)**2*ln(2*x)-
2*ln(x)**2-4*x*ln(x)+4*x)*exp(-x*ln(2*x)+x-15)+2*x*ln(x)**2+2*x**2*ln(x)-2*x**2)*exp(x/ln(x))
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{x^2e^{\frac{2x}{\log(x)}}}{5}-\frac{2xe^{\frac{2x}{\log(x)}}e^{-x(\log(x)+\log(2))+x-15}}{5}+\frac{e^{\frac{2x}{\log(x)}}e^{-2x(\log(x)+\log(2))+2x-30}}{5}$$

44.124 Problem number 9011

$$\int \frac{e^{\frac{3+e^{10}\left(-x^2-x^3\right)}{-e^{10}x^2+e^{10}x^2\log\left(\frac{x}{5\log(x)}\right)}}\left(3+e^{10}\left(-x^2-x^3\right)+\left(3+e^{10}\left(x^2+2x^3\right)\right)\log(x)+\left(-6-e^{10}x^3\right)\log(x)\log\left(\frac{x}{5\log(x)}\right)\right)}{e^{10}x^3\log(x)-2e^{10}x^3\log(x)\log\left(\frac{x}{5\log(x)}\right)+e^{10}x^3\log(x)\log^2\left(\frac{x}{5\log(x)}\right)}d$$

Optimal antiderivative

$$\mathrm{e}^{\frac{\frac{3\,\mathrm{e}^{-10}}{x^2}-x-1}{\ln\left(\frac{x}{5\ln(x)}\right)-1}}$$

command

```
integrate(((-x**3*exp(5)**2-6)*ln(x)*ln(1/5*x/ln(x))+((2*x**3+x**2)*exp(5)**2+3)*ln(x)+(-
x**3-x**2)*exp(5)**2+3)*exp(((-x**3-x**2)*exp(5)**2+3)/(x**2*exp(5)**2*ln(1/5*x/ln(x))-
x**2*exp(5)**2))/(x**3*exp(5)**2*ln(x)*ln(1/5*x/ln(x))**2-2*x**3*exp(5)**2*ln(x)*ln(1/5*x/ln(
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$e^{\frac{\left(-x^3-x^2\right)e^{10}+3}{x^2e^{10}\log\left(\frac{x}{5\log(x)}\right)-x^2e^{10}}}$$

44.125 Problem number 9095

$$\int \frac{30+30x+e^4\left(10+25x+15x^2\right)+\left(3x+e^4\left(-15x-15x^2\right)\right)\log(x)+e^4(15+15x)\log^2(x)+(-3-3x)\log(1+}{e^4\left(15x+15x^2\right)\log^2(x)}$$

Optimal antiderivative

$$\ln(x)+\frac{-\frac{2}{3}+\left(\frac{\ln(1+x)}{5}-2\right)\mathrm{e}^{-4}-x}{\ln(x)}$$

command

```
integrate(((-3*x-3)*ln(1+x)+(15*x+15)*exp(4)*ln(x)**2+((-15*x**2-15*x)*exp(4)+3*x)*ln(x)+(15*
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{-3xe^4-2e^4-6}{3e^4\log(x)}+\log(x)+\frac{\log(x+1)}{5e^4\log(x)}$$

44.126 Problem number 9101

$$\int \frac{2x\log(x)+\left(-x+\left(x+x^2-x^3\right)\log(x)\right)\log\left(2x^2\right)+\left(-2\log(x)+\left(-1+x^2\right)\log(x)\log\left(2x^2\right)\right)\log(\log(x))+\left(2x\right.}{-x^3\log(5)\log(x)\log^2\left(2x^2\right)+x^2\log(5)\log(x)\log^2\left(2x^2\right)\log(\log}$$

Optimal antiderivative

$$\frac{\ln\left(\frac{e^x}{\ln(\ln(x))-x}\right)+\frac{1}{x}}{\ln(2x^2)\ln(5)}$$

command

```
integrate(((-2*x*ln(x)*ln(ln(x))+2*x**2*ln(x))*ln(exp(x)/(ln(ln(x))-x))+((x**2-1)*ln(x)*ln(2*
2*ln(x))*ln(ln(x))+((-x**3+x**2+x)*ln(x)-x)*ln(2*x**2)+2*x*ln(x))/(x**2*ln(5)*ln(x)*ln(2*x**2
x**3*ln(5)*ln(x)*ln(2*x**2)**2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{1}{2x\log(5)\log(x)+x\log(2)\log(5)}+\frac{\log\left(\frac{e^x}{-x+\log(\log(x))}\right)}{2\log(5)\log(x)+\log(2)\log(5)}$$

44.127 Problem number 9111

$$\int \frac{-36x+36x^2+\left(3x-3x^2\right)\log(x)+\left(33x-108x^2+\left(-3x+9x^2\right)\log(x)\right)\log(2x)+\left(-36x+3x\log(x)+(72x-\right.}{(-12+\log(x))\log^2(2x)}$$

Optimal antiderivative

$$\frac{3x^2\left(x-1-\ln\left(\frac{\frac{\ln(x)}{4}-3}{2x}\right)\right)}{\ln(2x)}$$

command

```
integrate((((-6*x*ln(x)+72*x)*ln(2*x)+3*x*ln(x)-36*x)*ln(1/8*(ln(x)-12)/x)+((9*x**2-
3*x)*ln(x)-108*x**2+33*x)*ln(2*x)+(-3*x**2+3*x)*ln(x)+36*x**2-36*x)/(ln(x)-12)/ln(2*x)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$-\frac{3x^2\log\left(\frac{\frac{\log(x)}{8}-\frac{3}{2}}{x}\right)}{\log(x)+\log(2)}+\frac{3x^3-3x^2}{\log(x)+\log(2)}$$

44.128 Problem number 9117

$$\int \frac{3-x+e^x\left(-3-5x-x^2+x^3\right)\log(16)+\left(-x+e^x\left(1+x^2\right)\log(16)\right)\log\left(x+e^x\left(-1-x^2\right)\log(16)\right)\log\left(\log\left(x+\right.\right.}{\left(-x+e^x\left(1+x^2\right)\log(16)\right)\log\left(x+e^x\left(-1-x^2\right)\log(16)\right)}$$

Optimal antiderivative

$$(-3+x)\ln\left(\ln\left(x-4\ln(2)\left(\mathrm{e}^x x^2+\mathrm{e}^x\right)\right)\right)$$

command

```
integrate(((4*(x**2+1)*ln(2)*exp(x)-x)*ln(4*(-x**2-1)*ln(2)*exp(x)+x)*ln(ln(4*(-x**2-
1)*ln(2)*exp(x)+x))+4*(x**3-x**2-5*x-3)*ln(2)*exp(x)+3-x)/(4*(x**2+1)*ln(2)*exp(x)-
x)/ln(4*(-x**2-1)*ln(2)*exp(x)+x),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$(x-1)\log\left(\log\left(x+\left(-4x^2-4\right)e^x\log(2)\right)\right)-2\log\left(\log\left(x+\left(-4x^2-4\right)e^x\log(2)\right)\right)$$

44.129 Problem number 9277

$$\int \frac{e^x x^3+\left(324+324x+e^{e^{4x}}(324+324x)\right)\log\left(1+e^{e^{4x}}\right)+2e^x x^2\log(x)+e^x x\log^2(x)+e^{e^{4x}}\left(-1296e^{4x}x^2+e^x x^3\right.}{x^3+2x^2\log(x)+x\log^2(x)+e^{e^{4x}}\left(x^3+2x^2\log(x)+x\log^2(x)\right)}$$

Optimal antiderivative

$$\mathrm{e}^x-\frac{324\ln\left(\mathrm{e}^{\mathrm{e}^{4x}}+1\right)}{x+\ln(x)}$$

command

```
integrate((((324*x+324)*exp(exp(4*x))+324*x+324)*ln(exp(exp(4*x))+1)+(x*exp(x)*ln(x)**2+(-
1296*x*exp(4*x)+2*exp(x)*x**2)*ln(x)-1296*x**2*exp(4*x)+exp(x)*x**3)*exp(exp(4*x))+x*exp(x)*l
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$e^x-\frac{324\log\left(e^{e^{4x}}+1\right)}{x+\log(x)}$$

44.130 Problem number 9310

$$\int \frac{\left(8+2x-2x^2+e\left(16x+4x^2-4x^3\right)\right)\log(x)+\left(-4+8x+e\left(-4x+8x^2\right)\right)\log^2(x)\log\left(\frac{x+ex^2}{e}\right)+\left(-8-2x+2x\right.}{(1+ex)\log^2(x)\log}$$

Optimal antiderivative

$$\left(\frac{2\ln\left(\ln\left(x^2+\mathrm{e}^{-1}x\right)\right)x}{\ln(x)}-4\right)\left(-x^2+x+4\right)$$

command

```
integrate(((((-6*x**3+4*x**2+8*x)*exp(1)-6*x**2+4*x+8)*ln(x)+(2*x**3-2*x**2-8*x)*exp(1)+2*x**
2*x-8)*ln((x**2*exp(1)+x)/exp(1))*ln(ln((x**2*exp(1)+x)/exp(1)))+((8*x**2-4*x)*exp(1)+8*x-
4)*ln(x)**2*ln((x**2*exp(1)+x)/exp(1))+((-4*x**3+4*x**2+16*x)*exp(1)-2*x**2+2*x+8)*ln(x))/(x*
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$4x^2-4x+\frac{\left(-2x^3+2x^2+8x\right)\log\left(\log\left(\frac{ex^2+x}{e}\right)\right)}{\log(x)}$$

44.131 Problem number 9541

$$\int \frac{e^{\frac{9+123x+30x^2}{10\log\left(\frac{2+x^2}{x}\right)}}\left(18+246x+51x^2-123x^3-30x^4+\left(246x+120x^2+123x^3+60x^4\right)\log\left(\frac{2+x^2}{x}\right)+\left(20+10x^2\right)\log\right.}{\left(20+10x^2\right)\log^2\left(\frac{2+x^2}{x}\right)}$$

Optimal antiderivative

$$x\,\mathrm{e}^{\frac{3x+3(3+x)\left(\frac{1}{10}+x\right)}{\ln\left(x+\frac{2}{x}\right)}}$$

command

```
integrate(((10*x**2+20)*ln((x**2+2)/x)**2+(60*x**4+123*x**3+120*x**2+246*x)*ln((x**2+2)/x)-
30*x**4-123*x**3+51*x**2+246*x+18)*exp(1/10*(30*x**2+123*x+9)/ln((x**2+2)/x))/(10*x**2+20)/ln
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$xe^{\frac{3x^2+\frac{123x}{10}+\frac{9}{10}}{\log\left(\frac{x^2+2}{x}\right)}}$$

44.132 Problem number 9749

$$\int \frac{-50x - 20e^4x - 2e^8x + \left(-20x - 4e^4x\right)\log(x) - 2x\log^2(x) + e^{\frac{x^3+x^2\log(4)}{5+e^4+\log(x)}}\left(25 + e^8 + 14x^3 + e^4\left(10+3x^3\right) + \left(9x^2\right.\right.}{25 + 10e^4 + e^8 + \left(10 + 2e^4\right)\log(x) + \log^2(x)}$$

Optimal antiderivative

$$x\left(\mathrm{e}^{\frac{(x+2\ln(2))x^2}{\ln(x)+5+\mathrm{e}^4}} - x\right)$$

command

```
integrate(((ln(x)**2+(4*x**2*ln(2)+2*exp(4)+3*x**3+10)*ln(x)+2*(2*x**2*exp(4)+9*x**2)*ln(2)+e
2*x*ln(x)**2+(-4*x*exp(4)-20*x)*ln(x)-2*x*exp(4)**2-20*x*exp(4)-50*x)/(ln(x)**2+(2*exp(4)+10)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$-x^2 + xe^{\frac{x^3+2x^2\log(2)}{\log(x)+5+e^4}}$$

44.133 Problem number 9775

$$\int \frac{\left(e^{10} - e^5x\right)\log^2\left(e^{10} - 2e^5x + x^2\right) + e^{\frac{4x^3}{e^5\log\left(e^{10}-2e^5x+x^2\right)}}\left(8x^3 + \left(12e^5x^2 - 12x^3\right)\log\left(e^{10} - 2e^5x + x^2\right)\right)}{\left(e^{10} - e^5x\right)\log^2\left(e^{10} - 2e^5x + x^2\right)}\,dx$$

Optimal antiderivative

$$1 + \mathrm{e}^{\frac{4x^3\mathrm{e}^{-5}}{\ln\left(\left(\mathrm{e}^5-x\right)^2\right)}} + x$$

command

```
integrate((((12*x**2*exp(5)-12*x**3)*ln(exp(5)**2-2*x*exp(5)+x**2)+8*x**3)*exp(4*x**3/exp(5)/
2*x*exp(5)+x**2))+(exp(5)**2-x*exp(5))*ln(exp(5)**2-2*x*exp(5)+x**2)**2)/(exp(5)**2-
x*exp(5))/ln(exp(5)**2-2*x*exp(5)+x**2)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$x + e^{\frac{4x^3}{e^5\log\left(x^2-2xe^5+e^{10}\right)}}$$

44.134 Problem number 9947

$$\int \frac{e^{\frac{3x^2+5x^3+2x^4}{(4+8x)\log\left(x^2\right)}}\left(-6x^2-22x^3-24x^4-8x^5+\left(6x^2+21x^3+28x^4+12x^5\right)\log\left(x^2\right)+\left(-8-32x-32x^2\right)\log^2\left(x^2\right)\right.}{\left(4x^3+16x^4+16x^5\right)\log^2\left(x^2\right)}$$

Optimal antiderivative

$$\frac{\mathrm{e}^{\frac{x\left(\frac{x}{1+2x}+x^2+2x\right)}{4\ln\left(x^2\right)}}}{x^2}$$

command

```
integrate(((-32*x**2-32*x-8)*ln(x**2)**2+(12*x**5+28*x**4+21*x**3+6*x**2)*ln(x**2)-
8*x**5-24*x**4-22*x**3-6*x**2)*exp((2*x**4+5*x**3+3*x**2)/(8*x+4)/ln(x**2))/(16*x**5+16*x**4+
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{e^{\frac{2x^4+5x^3+3x^2}{(8x+4)\log\left(x^2\right)}}}{x^2}$$

44.135 Problem number 10034

$$\int \frac{e^{9e^{\frac{2\left(-4x-x^2\right)}{6-3x+3\log(x)}}+\frac{2\left(-4x-x^2\right)}{6-3x+3\log(x)}}\left(-24-18x+6x^2+(-24-12x)\log(x)\right)}{4-4x+x^2+(4-2x)\log(x)+\log^2(x)}\,dx$$

Optimal antiderivative

$$\mathrm{e}^{9\,\mathrm{e}^{\frac{2(4+x)x}{3x-3\ln(x)-6}}}$$

command

```
integrate(((-12*x-24)*ln(x)+6*x**2-18*x-24)*exp((-x**2-4*x)/(3*ln(x)-3*x+6))**2*exp(9*exp((-
x**2-4*x)/(3*ln(x)-3*x+6))**2)/(ln(x)**2+(4-2*x)*ln(x)+x**2-4*x+4),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$e^{9e^{\frac{2\left(-x^2-4x\right)}{-3x+3\log(x)+6}}}$$

44.136 Problem number 10123

$$\int \frac{7x^2 + (12+4x)\log^3(5x)\log(3+x) + \log^4(5x)(-x+(-3-x)\log(3+x))}{147x^2 + 49x^3 + (-42x-14x^2)\log^4(5x) + (3+x)\log^8(5x)}\,dx$$

Optimal antiderivative

$$\frac{\ln(3+x)\,x}{7x - \ln(5x)^4}$$

command

```
integrate((((-3-x)*ln(3+x)-x)*ln(5*x)**4+(4*x+12)*ln(3+x)*ln(5*x)**3+7*x**2)/((3+x)*ln(5*x)**
14*x**2-42*x)*ln(5*x)**4+49*x**3+147*x**2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{x\log(x+3)}{7x - \log(5x)^4}$$

44.137 Problem number 10148

$$\int \frac{e^{-\frac{-5x+e^5x+\left(-5+e^5\right)\log(x)+\log\left(\frac{x}{\log(x)}\right)}{x+\log(x)}}\left(e^{\frac{-5x+e^5x+\left(-5+e^5\right)\log(x)+\log\left(\frac{x}{\log(x)}\right)}{x+\log(x)}}\left(x^2\log(x)+2x\log^2(x)+\log^3(x)\right)+e^{e^{-\frac{-5x+e^5}{}}}\right.}{}$$

Optimal antiderivative

$$\mathrm{e}^{-2+x\,\mathrm{e}^{-\frac{\ln\left(\frac{x}{\ln(x)}\right)}{x+\ln(x)}-\mathrm{e}^5+5}}+x$$

command

```
integrate((((1+x)*ln(x)*ln(x/ln(x))+ln(x)**3+(-1+2*x)*ln(x)**2+(x**2-x+1)*ln(x)+x)*exp((-
2*exp((ln(x/ln(x))+(exp(5)-5)*ln(x)+x*exp(5)-5*x)/(x+ln(x)))+x)/exp((ln(x/ln(x))+(exp(5)-
5)*ln(x)+x*exp(5)-5*x)/(x+ln(x))))+(ln(x)**3+2*x*ln(x)**2+x**2*ln(x))*exp((ln(x/ln(x))+(exp(5
5)*ln(x)+x*exp(5)-5*x)/(x+ln(x))))/(ln(x)**3+2*x*ln(x)**2+x**2*ln(x))/exp((ln(x/ln(x))+(exp(5
5)*ln(x)+x*exp(5)-5*x)/(x+ln(x))),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$x+e^{\left(x-2e^{\frac{-5x+xe^5+\left(-5+e^5\right)\log(x)+\log\left(\frac{x}{\log(x)}\right)}{x+\log(x)}}\right)e^{-\frac{-5x+xe^5+\left(-5+e^5\right)\log(x)+\log\left(\frac{x}{\log(x)}\right)}{x+\log(x)}}}$$

44.138 Problem number 10161

$$\int \frac{128-32x+64x^2-16x^3+8x^4-2x^5+\left(40-530x+280x^2-545x^3+258x^4-128x^5+48x^6-6x^7\right)\log(x)+}{}$$

Optimal antiderivative

$$\left(\left(x^2+4\right)^2+\ln(x)\right)x\left(\frac{\ln\left(\ln(x)^2\right)}{\ln(x)-x+4}-x\right)$$

command

```
integrate(((ln(x)**3+(5*x**4+24*x**2+20)*ln(x)**2+(-4*x**5+19*x**4-16*x**3+88*x**2-
x+52)*ln(x))*ln(ln(x)**2)-2*x*ln(x)**4+(-6*x**5-32*x**3+4*x**2-49*x)*ln(x)**3+(12*x**6-
48*x**5+64*x**4-258*x**3+82*x**2-296*x+2)*ln(x)**2+(-6*x**7+48*x**6-128*x**5+258*x**4-
545*x**3+280*x**2-530*x+40)*ln(x)-2*x**5+8*x**4-16*x**3+64*x**2-32*x+128)/(ln(x)**3+(-
2*x+8)*ln(x)**2+(x**2-8*x+16)*ln(x)),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$-x^6-8x^4-x^2\log(x)-16x^2+\frac{\left(-x^5-8x^3-x\log(x)-16x\right)\log\left(\log(x)^2\right)}{x-\log(x)-4}$$

44.139 Problem number 10182

$$\int \frac{e^x(1-x)+\left(-4e^{2x}+e^x x\right)\log\left(e^{-x}(-4e^x+x)\right)\log\left(\log\left(e^{-x}(-4e^x+x)\right)\right)+\left(8e^{2x}-2e^x x\right)\log\left(e^{-x}(-4e^x+x)\right)}{\left(8e^x-2x\right)\log\left(e^{-x}\left(-4e^x+x\right)\right)}$$

Optimal antiderivative

$$\left(\ln(\ln(4\ln(2)))-\frac{\ln(\ln(x\,\mathrm{e}^{-x}-4))}{2}\right)\mathrm{e}^x$$

command

```
integrate(((-4*exp(x)**2+exp(x)*x)*ln((-4*exp(x)+x)/exp(x))*ln(ln((-4*exp(x)+x)/exp(x)))+(8*e
2*exp(x)*x)*ln((-4*exp(x)+x)/exp(x))*ln(ln(4*ln(2)))+(1-x)*exp(x))/(8*exp(x)-2*x)/ln((-
4*exp(x)+x)/exp(x)),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Timed out

Sympy 1.8 under Python 3.8.8 output

$$-\frac{e^{x}\log\left(\log\left(\left(x-4e^{x}\right)e^{-x}\right)\right)}{2}+e^{x}\log\left(\log\left(\log\left(2\right)\right)+2\log\left(2\right)\right)$$

44.140 Problem number 10263

$$\int\frac{-507x^{2}+481x^{3}-152x^{4}+16x^{5}+\left(-234x^{2}+150x^{3}-24x^{4}\right)\log\left(81-108x+54x^{2}-12x^{3}+x^{4}\right)+\left(-27x^{2}+\right.}{-507x^{2}+481x^{3}-152x^{4}+16x^{5}+\left(-234x^{2}+150x^{3}-24x^{4}\right.}$$

Optimal antiderivative

$$x+\mathrm{e}^{\frac{1}{x\left(-4x+13+3\ln\left(\left(-3+x\right)^{4}\right)\right)}}$$

command

```
integrate((((-3*x+9)*ln(x**4-12*x**3+54*x**2-108*x+81)+8*x**2-49*x+39)*exp(1/(3*x*ln(x**4-
12*x**3+54*x**2-108*x+81)-4*x**2+13*x))+(9*x**3-27*x**2)*ln(x**4-12*x**3+54*x**2-108*x+81)**2
24*x**4+150*x**3-234*x**2)*ln(x**4-12*x**3+54*x**2-108*x+81)+16*x**5-152*x**4+481*x**3-
507*x**2)/((9*x**3-27*x**2)*ln(x**4-12*x**3+54*x**2-108*x+81)**2+(-24*x**4+150*x**3-
234*x**2)*ln(x**4-12*x**3+54*x**2-108*x+81)+16*x**5-152*x**4+481*x**3-507*x**2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$x+e^{\frac{1}{-4x^{2}+3x\log\left(x^{4}-12x^{3}+54x^{2}-108x+81\right)+13x}}$$

44.141 Problem number 10318

$$\int \frac{\left(-208x-60x^2+108x^3-36x^4+4x^5\right)\log(2x)+\left(-60+164x-57x^2-15x^3+9x^4-x^5\right)\log\left(\frac{400-1920x+2424x^2}{81-}\right.}{\left(60x-164x^2+57x^3+15x^4-9x^5+x^6\right)\log^2(2x)}$$

Optimal antiderivative

$$\frac{\ln\left(\left(\left(x+\frac{4}{3-x}\right)^2-4\right)^2\right)}{\ln(2x)}$$

command

```
integrate(((-x**5+9*x**4-15*x**3-57*x**2+164*x-60)*ln((x**8-12*x**7+30*x**6+132*x**5-
607*x**4-48*x**3+2424*x**2-1920*x+400)/(x**4-12*x**3+54*x**2-108*x+81))+(4*x**5-36*x**4+108*x
60*x**2-208*x)*ln(2*x))/(x**6-9*x**5+15*x**4+57*x**3-164*x**2+60*x)/ln(2*x)**2,x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{\log\left(\frac{x^8-12x^7+30x^6+132x^5-607x^4-48x^3+2424x^2-1920x+400}{x^4-12x^3+54x^2-108x+81}\right)}{\log(2x)}$$

44.142 Problem number 10323

$$\int \frac{5-5e^x+5x-5x^2+\left(5+4x^2+x^3+e^x(-5+6x)\right)\log(x)+\left(-x^3+e^x\left(x-x^2\right)\right)\log^2(x)+\left(5+(5-x)\log(x)\right.}{-5x^2\log^2(x)+x^3\log^3(x)}$$

Optimal antiderivative

$$\frac{x-\mathrm{e}^x+1-x^2+\ln\left(\frac{x\ln(x)}{2}-\frac{5}{2}\right)}{\ln(x)\,x}$$

command

```
integrate(((-x*ln(x)**2+ln(x)*(5-x)+5)*ln(1/2*x*ln(x)-5/2)+((-x**2+x)*exp(x)-x**3)*ln(x)**2+(
5)*exp(x)+x**3+4*x**2+5)*ln(x)-5*exp(x)-5*x**2+5*x+5)/(x**3*ln(x)**3-5*x**2*ln(x)**2),x)
```

Sympy 1.10.1 under Python 3.10.4 output

Exception raised: TypeError

Sympy 1.8 under Python 3.8.8 output

$$\frac{-x^2+x+1}{x\log(x)}-\frac{e^x}{x\log(x)}+\frac{\log\left(\frac{x\log(x)}{2}-\frac{5}{2}\right)}{x\log(x)}$$