

HOMEWORK 7 - DUE OCTOBER 29

Homework instructions: Complete the assigned problems on your own paper. Once you are finished, scan or photograph your work and upload it to Gradescope. When prompted, tell Gradescope where to find each problem.

You are allowed (and in fact encouraged) to work with other students on homework assignments. If you do that, please indicate on each problem who you worked with. If you use sources other than your notes, the textbook, and any resources on Canvas for your homework, you must indicate the source on each problem. You are not permitted to view, request, or look for solutions to any of the homework problems from solutions manuals, homework help websites, online forums, other students, or any other sources.

Textbook Problems:

- §5.5: 3, 9, 11, 23, 32
- §6.1: 7, 17, 21, 25, 29

Additional Problems:

1. On the last homework, you found the general solution for the differential equation

$$y^{(7)} - 2y^{(6)} + 9y^{(5)} - 16y^{(4)} + 24y^{(3)} - 32y'' + 16y' = 0$$

Using your solution to that problem, find the appropriate form for of a particular solution y_p to the differential equation below. Do *not* find the values of the coefficients!

$$y^{(7)} - 2y^{(6)} + 9y^{(5)} - 16y^{(4)} + 24y^{(3)} - 32y'' + 16y' = e^{2x} + x \sin x + x^2$$

2. Let $A = \begin{bmatrix} t_1 & 0 & 0 \\ 0 & t_2 & 0 \\ 0 & 0 & t_3 \end{bmatrix}$ where t_1, t_2, t_3 are distinct real numbers. Find the eigenvalues of A and the corresponding eigenvectors.
3. *This problem is optional.* Extend the result in problem 2 to the case of $n \times n$ matrices. That is, let A be a matrix with entries t_1, t_2, \dots, t_n on the main diagonal and 0s everywhere else, where the t_i are distinct real numbers. Find the eigenvalues and corresponding eigenvectors.