Verification of solution for example 3.9 .3 in book

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set up A matrix

In[1]:=
```
(A = {{-1, -1}, {1, -1}}) // MatrixForm
```

Out[1]//MatrixForm=

$$\begin{pmatrix} -1 & -1 \\ 1 & -1 \end{pmatrix}$$

Find its eigenvalues

In[2]:=
```
(eigs = Eigenvalues[A]) // MatrixForm
```

Out[2]//MatrixForm=

$$\begin{pmatrix} -1+i \\ -1-i \end{pmatrix}$$

Set up the equations to solve for b_0 and b_1

In[3]:=
```
eq1 = Exp[eigs[[1]] t] == b0 + b1 eigs[[1]] // Simplify
eq2 = Exp[eigs[[2]] t] == b0 + b1 eigs[[2]] // Simplify
```

Out[3]=
$$b0 - (1 - i)\, b1 == e^{(-1+i)\,t}$$

Out[4]=
$$b0 - (1 + i)\, b1 == e^{(-1-i)\,t}$$

Solve the above equations for b_0 and b_1

In[14]:=
```
Clear[b0, b1];
sol = First@Solve[{eq1, eq2}, {b0, b1}];
b0 = ExpToTrig[b0 /. sol] // FullSimplify;
b1 = ExpToTrig[b1 /. sol] // FullSimplify;
Print["b0=", b0];
Print["b1=", b1];
```

$b_0 = e^{-t}\,(\text{Cos}[t] + \text{Sin}[t])$

$b_1 = e^{-t}\,\text{Sin}[t]$

Now display e^{At}

```
(b0 * IdentityMatrix[2] + b1 A) // FullSimplify // MatrixForm
```

Out[21]//MatrixForm=

$$\begin{pmatrix} e^{-t}\,\text{Cos}[t] & -e^{-t}\,\text{Sin}[t] \\ e^{-t}\,\text{Sin}[t] & e^{-t}\,\text{Cos}[t] \end{pmatrix}$$

Redo the solution, but change the b0 and b1 order, we obtain the solution given in class

Now display e^{At}

In[39]:=
```
(b1 * IdentityMatrix[2] + b0 A) // FullSimplify // MatrixForm
```

Out[39]//MatrixForm=

$$\begin{pmatrix} -e^{-t}\,\text{Cos}[t] & -e^{-t}\,(\text{Cos}[t]+\text{Sin}[t]) \\ e^{-t}\,(\text{Cos}[t]+\text{Sin}[t]) & -e^{-t}\,\text{Cos}[t] \end{pmatrix}$$