HW3

(1) $$\dot{\underset{\sim}{x}} = \begin{pmatrix} 3 & 2 & 4 \\ 2 & 0 & 2 \\ 4 & 2 & 3 \end{pmatrix} \underset{\sim}{x}$$

Solve the above system. Note: while one of the eigenvalues is repeated, you will not have trouble find 2 associated vectors.

(2) Solve $\dot{\underline{x}} = \begin{pmatrix} 1 & 1 \\ 4 & 1 \end{pmatrix} \underline{x}$; $\underline{x}(0) = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$

(3) Optional: show that the eigenvalues of $T^{-1}AT$ are the same as those for A

(4) Optional: verify the Cayley Hamilton Theorem for

$$A = \begin{pmatrix} 1 & -1 & -1 \\ 2 & 1 & -1 \\ -1 & -1 & 1 \end{pmatrix}$$

(5) Compute e^{At}, given $A = \begin{pmatrix} 1 & 1 & 1 \\ 0 & 3 & 2 \\ 0 & 0 & 5 \end{pmatrix}$

(6) Solve $\dot{\underset{\sim}{x}} = \begin{pmatrix} 2 & -5 \\ 1 & -2 \end{pmatrix} \underline{x} + \begin{pmatrix} \sin t \\ 0 \end{pmatrix}$ with $\underset{\sim}{x}(0) = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$

(7) Optional: fill in the details for the problem done in class, namely

$$\dot{\underset{\sim}{x}} = \begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & -2 \\ 3 & 2 & 1 \end{pmatrix} \underset{\sim}{x} + \begin{pmatrix} 0 \\ 0 \\ e^t \cos 2t \end{pmatrix} ; \quad x(0) = \begin{pmatrix} 0 \\ 1 \\ 1 \end{pmatrix}$$

8 Solve $\dot{\underset{\sim}{x}} = \begin{pmatrix} 3 & -4 \\ -1 & -1 \end{pmatrix} \underset{\sim}{x} + \begin{pmatrix} 1 \\ 1 \end{pmatrix} e^t$

$$\underset{\sim}{x}(0) = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$$