Math 3323 Exam 3 Practice

(1) Find a fundamental matrix for $\dot{x} = Ax$ for each A given bellow

(a) $\begin{pmatrix} 3 & -2 \\ 2 & -2 \end{pmatrix}$ (b) $\begin{pmatrix} 4 & 1 \\ 1 & 4 \end{pmatrix}$

(c) $\begin{pmatrix} 3 & 0 \\ 1 & 7 \end{pmatrix}$ (d) $\begin{pmatrix} 0 & -1 \\ 2 & 3 \end{pmatrix}$.

(2) Find at least one solution to each of the following inhomogeneous problems

(a) $\ddot{x} - 8x = t^2 - 1$ (b) $\ddot{x} - 8x = 3t$

(c) $\ddot{x} + 9x = \cos(3t)$ (d) $\ddot{x} + 9x = \cos(3t)^2$

(e) $\ddot{x} - 2\dot{x} - x = \cos(t)$ (f) $\ddot{x} - 2\dot{x} - x = \sin(t)$.

(3) Solve each IVP bellow

(a) $\dot{x} = \begin{pmatrix} 2 & 3 \\ 0 & 1 \end{pmatrix} x + \begin{pmatrix} te^t \\ 7 \end{pmatrix}$, $x(0) = \begin{pmatrix} -1 \\ -2 \end{pmatrix}$

(b) $\dot{x} = \begin{pmatrix} 8 & 2 \\ 2 & 8 \end{pmatrix} x + \begin{pmatrix} 0 \\ -\sin(t) \end{pmatrix}$, $x(0) = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$

(c) $\dot{x} = \begin{pmatrix} 1 & 4 \\ 0 & 1 \end{pmatrix} x + \begin{pmatrix} e^t \\ 0 \end{pmatrix}$, $x(0) = \begin{pmatrix} 3 \\ 3 \end{pmatrix}$

(d) $\dot{x} = \begin{pmatrix} 1 & 4 \\ 0 & 1 \end{pmatrix} x + \begin{pmatrix} e^t \\ 0 \end{pmatrix}$, $x(0) = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$.

(4) For each of the inhomogeneous equations in Problem #2, find the solution with initial conditions $x(0) = 0$ and $\dot{x}(0) = 1$.