King Fahd University of Petroleum and Minerals
Quiz 4 Math 202-141 Duration 40 minutes

Full Name:
ID:
Section and Serial number:

Question 1. Show that (without solving the system) the general solution of

$$X' = \begin{bmatrix} -4 & 1 & 1 \\ 1 & 5 & -1 \\ 0 & 1 & -3 \end{bmatrix} X$$

on $(-\infty, \infty)$ is

$$X = C_1 \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} \mathrm{e}^{-3t} + C_2 \begin{bmatrix} -10 \\ 1 \\ -1 \end{bmatrix} \mathrm{e}^{-4t} + C_3 \begin{bmatrix} 1 \\ 8 \\ 1 \end{bmatrix} \mathrm{e}^{5t}.$$

Question 2. Solve

$$a)\quad X' = \begin{bmatrix} 3 & 1 & -1 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix} X \quad \text{with} \quad X(0) = \begin{bmatrix} 4 \\ 0 \\ 3 \end{bmatrix}$$

$$b)\quad X' = \begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix} X + \begin{bmatrix} \cos t \\ \sin t \end{bmatrix} \mathrm{e}^{t}$$

$$c) \quad X' = \begin{bmatrix} 0 & 1 & 2 \\ -5 & -3 & -7 \\ 1 & 0 & 0 \end{bmatrix} X$$