King Fahd University of Petroleum and Minerals
Department of Mathematics and Statistics
Math 260 – Term 172 – Quiz 5

Name:
Student ID #:

Question 1. Solve the initial value problem $X'(t) = \begin{bmatrix} -1 & -4 \\ -1 & -1 \end{bmatrix} X(t)$, $X(0) = \begin{bmatrix} 4 \\ 4 \end{bmatrix}$.

QUESTION 2 IS ON THE BACK OF THE PAGE.

Question 2. Consider the system $X'(t) = AX(t)$ where $A = \begin{bmatrix} 5 & -1 & 1 \\ -1 & 9 & -3 \\ -2 & 2 & 4 \end{bmatrix}$. Assume that $\lambda = 6$ is the only eigenvalue of A and $v = \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}$ is the only eigenvector of A.

(1) Find a length 3 list of generalized eigenvectors $\{u_1, u_2, u_3\}$.
(2) Find three linearly independent solutions of the system.
(3) Find matrices Q and J where J is the Jordan normal form of A and Q is an invertible matrix so that $A = QJQ^{-1}$.