Polytechnic University

MA 2132 WORKSHEET 4 DATE:

Print Name:

Signature:

ID #:

Instructor:

Problem	Possible	Points
1	25	
2	25	
3	25	
4	25	
Total	100	

YOUR SIGNATURE:

(1) Rewrite the differential equation as a first order system.

(a) $x'' - tx' + x^2 = \sin t$

(b) $x''' - x'' + x = e^t$

YOUR SIGNATURE:

(2) Find the matrix A and vector b if the given system is written as $x' = Ax + b$.

(a) $x_1' = -2x_1 + x_2 + \cos(2t)$
$x_2' = -x_1 - x_2 - 2\sin(2t)$

(b) $x_1' = e^t x_1 - e^{-t} x_2$
$x_2' = 2e^{-t} x_1 + 3e^t x_2$

(c) $x_1' = 2x_1 + x_2 - x_3 + 2e^{-t}$
$x_2' = x_1 - x_2 - e^{-t}$
$x_3' = x_1 + e^t x_2$

(3) Determine whether or not the given set of vector functions is linearly dependent. The interval of definition is assumed to be the set of all real numbers.

(a) $u_1(t) = [2t - 1, -t]$ and $u_2(t) = [-t + 1, 2t]$

(b) $u_1(t) = [2 - t, t, -2]$, $u_2(t) = [t, -1, 2]$ and $u_3(t) = [2 + t, t - 2, 2]$

(c) $u_1(t) = [e^t, 0, 0]$, $u_2(t) = [0, \cos t, \cos t]$ and $u_3(t) = [0, \sin t, \sin t]$

YOUR SIGNATURE:

(4) Find the solution of the equation $x' = Ax$, where A is the given matrix.

(a)

$$A = \begin{pmatrix} 2 & 4 \\ -2 & -2 \end{pmatrix} \text{ and } x(0) = [1, 3]$$

(b)

$$A = \begin{pmatrix} 5 & 0 & 0 \\ 4 & -4 & -2 \\ -2 & 12 & 6 \end{pmatrix} \text{ and } x(0) = [-1, 2, -8]$$