Math 319
Quiz 2
Section 8:00-9:15AM

Slemrod
March 31, 2005

NAME: _____

TA's NAME: _____

Calculators Okay!

Problem	**Score**
1	
2	
3	
4	
Total	

SHOW YOUR WORK!

1. Use Laplace transforms to solve the ordinary differential equation

$$y'' + 9y = g(t), \;\; y(0) = 0, \; y'(0) = 0$$

where

$$g(t) = \begin{cases} 0 & 0 \le t \le 10 \, , \\ \frac{(t-10)}{10}, & 10 \le t < 20 \, , \\ 1 & 20 < t \, . \end{cases}$$

ANS.

(20 pts)

2. Solve using Laplace transforms

$$2y'' + y' + 4y = \delta(t - \frac{\pi}{6}) \cos t,$$

$$y(0) = 0,\ y'(0) = 0.$$

($\sin \frac{\pi}{6} = \frac{1}{2}$, $\cos \frac{\pi}{6} = \frac{\sqrt{3}}{2}$) where δ is the unit impulse function.

ANS.

(30 pts)

3. Find the Laplace transform of

$$\int_0^t (t-\tau)\cos 2\tau d\tau.$$

ANS.

(10 pts)

4. (a) Use the eigenvalue – eigenvector method to find the general solution of

$$\mathbf{x}' = \begin{bmatrix} 1 & -2 \\ 3 & -4 \end{bmatrix} \mathbf{x}.$$

ANS.

(20 pts)

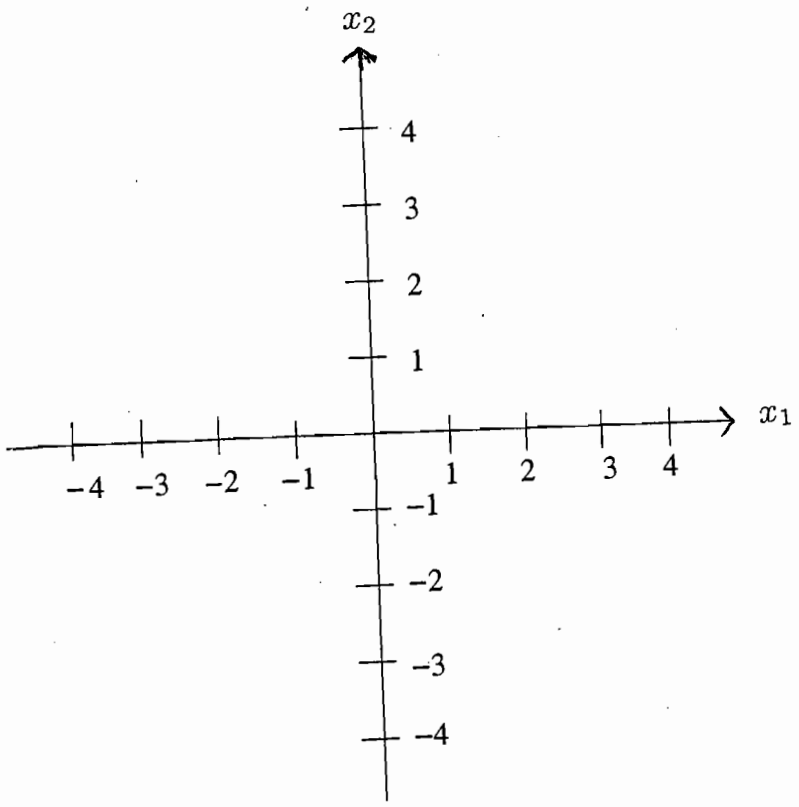
(b) Use the result in (a) to solve the initial value problem with

$$\mathbf{x}(0) = \begin{bmatrix} 4 \\ 4 \end{bmatrix}.$$

ANS.

(10 pts)

(c) Use your result in (a) to plot a few trajectories in the x_1, x_2 plane. Use arrows to denote increasing t.



(10 pts)