Math 319 Slemrod
Quiz 3 April 28, 2005
Section 11:00-12:15PM

NAME: _____

TA's NAME: _____

Calculators Okay!

Problem	Score
1	
2	
3	
Total	

SHOW YOUR WORK!

1. Solve the initial value problem

$$\mathbf{x}' \begin{bmatrix} 3 & 4 \\ 4 & -3 \end{bmatrix} \mathbf{x},$$

$$\mathbf{x}(0) = \begin{bmatrix} 1 \\ 1 \end{bmatrix}.$$

ANS.

(20 pts)

2. (a) Solve the initial value problem for the system via the eigenvalue - eigenvector method

$$\mathbf{x}' = \begin{bmatrix} 1 & -3 \\ 3 & 7 \end{bmatrix} \mathbf{x}, \qquad \mathbf{x}(0) = \begin{bmatrix} 1 \\ 1 \end{bmatrix}.$$

ANS.

(20 pts)

(b) Solve the initial value problem for the system

$$\mathbf{x}' = \begin{bmatrix} 1 & -3 \\ 3 & 7 \end{bmatrix} \mathbf{x} + \begin{bmatrix} 3e^t \\ -5e^t \end{bmatrix}$$

$$\mathbf{x}(0) = \begin{bmatrix} 1 \\ 1 \end{bmatrix}.$$

ANS.

(20 pts)

3. For the system

$$\frac{dx}{dt} = (4-y)(x+y)$$

$$\frac{dy}{dt} = (2+y)(x-y)$$

(a) Determine all critical points

ANS.

(10 pts)

(b) Find corresponding linear system near each critical points.

ANS.

(10 pts)

(c) Find the eigenvalues of each linear system. What conclusions can you draw about the nonlinear system near each critical point?

(asymptotically stable or unstable node, unstable saddle, asymptotically stable or unstable spiral, center)

ANS.

(10 pts)

(d) Sketch a phase portrait for the nonlinear system.

ANS.

(10 pts)