

Name: _____

Math 2410
Exam 2

You must show your work to receive credit.

1. Consider the linear system $\vec{Y}' = A\vec{Y}$ where $\vec{Y} = (x(t), y(t))$

$$A = \begin{pmatrix} 4 & -2 \\ 1 & 7 \end{pmatrix}$$

Find the general solution. Solve for $x(0) = 1, y(0) = -1$.

2. Consider the linear system $\vec{Y}' = A\vec{Y}$ where

$$A = \begin{pmatrix} -3 & -2 \\ 3 & 2 \end{pmatrix}$$

Find the eigenvalues, eigenvectors and sketch the phase plane.

3. Consider the linear system $\vec{Y}' = A\vec{Y}$ where

$$A = \begin{pmatrix} 3 & 2 \\ -2 & 3 \end{pmatrix}$$

(a) Compute the eigenvalues of A .

(b) Classify the equilibrium at the origin. Sketch the phase plane and classify as spiral source, spiral sink, or center.

(c) Find the solution for the initial value problem $x(0) = 1, y(0) = 0$.

4. Find the solution for the problem $y''+2y'+10y = 6 \cos(2t)-4 \sin(2t)$, $y(0) = 1$, $y'(0) = 2$

5. Find the general solution for the problem $y'' + 6y' + 9y = e^{-3t}$. Solve with initial conditions $y(0) = 0, y'(0) = 1$.

6. Find the general solution for the problem $y'' + 9y = \sin(2t)$. find the solution for the initial value problem $y(0) = 0, y'(0) = 0$.

7. Find the general solution for the problem $y'' + 9y = \cos(3t)$. Find the solution for the initial value problem $y(0) = 0, y'(0) = 0$.