

## DECA Chapter 9-10 Test

by Tarang Srivastava

- 1.** Classify the following information given information about the eigenvalues of a system of the form

$$\mathbf{x}' = \mathbf{A}\mathbf{x}$$

1. What is the stability if both eigenvalues are positive?
  2. What is the type of critical point if both eigenvalues are negative?
  3. what is critical point, and the stability if one eigenvalue is positive and the other is negative?
  4. What is the stability if there is only one negative eigenvalue?
  5. Draw a phase plane of a node.
  6. Draw a phase portrait of spiral point.
- 2.** Find the critical points for the system and classify the critical points by looking at the direction fields

$$dx/dt = -(x - y)(1 - x - y)$$

$$dy/dt = x(2 + y)$$

- 3.** Find the critical point where the system is stable

$$dx/dt = x(1 - x - y)$$

$$dy/dt = y(0.75 - y - 0.5x)$$

- 4.** Solve the boundary value problem

$$y'' + 2y = 0$$

for  $y(0) = 1$ , and  $y(\pi) = 0$

- 5.** Solve the boundary value problem

$$y'' + y = 0$$

for  $y(0) = 1$ , and  $y(\pi) = a$  where  $a$  is just some number

- 6.** Solve the boundary value problem

$$y'' + y = 0$$

for  $y(0) = 0$ , and  $y(\pi) = 0$

- 7.** Determine the Fourier series for the function

$$f(x) = \begin{cases} -x, & -2 \leq x < 0, \\ x, & 0 \leq x < 2 \end{cases}$$

$$f(x + 4) = f(x)$$