

Due at the beginning of class on the day of Test 3

Direction: Solve the problems in this worksheet on separate sheets of paper. Write your solution neatly. Use standard size paper. Clearly label each problem, and include each problem in the correct order. No ragged edges. Staple multiple pages. At the top of the first page put your name, Math 2320, and the title of the homework assignment. Show all work to justify your answer. Answer with insufficient work will receive no credit.

Problem 1: Verification of Solutions

1. Verify that the set of functions $x(t) = 2t + 5$ and $y(t) = -t + 1$ is a solution to the system

$$\frac{dx}{dt} = x + 4y + 2t - 7$$

$$\frac{dy}{dt} = 3x + 2y - 4t - 18$$

2. Verify that the set of functions $x(t) = e^t + te^t$ and $y(t) = e^t - te^t$ is a solution to the system

$$\frac{dx}{dt} = 2x + y - e^t$$

$$\frac{dy}{dt} = 3x + 4y - 7e^t$$

Problem 2: Convert nth-order equations into a system

1. Convert the equation $y^{(4)} - y''' + 7y = \cos t$ to a linear system of first order equations.
2. Convert the system of equations

$$x''' = 3y' + \cos t$$

$$y'' = 2ty' - x + e^t$$

into a linear system of first order equations.

Problem 3: Solve a homogeneous linear system - distinct, real roots

Solve the given system

1.

$$x' = 2x - 3y$$

$$y' = x - 2y$$

2.

$$x' = x + 3y, x(0) = 3$$

$$y' = 3x + y, y(0) = 1$$

Problem 4: Solve a homogeneous linear system - repeated real roots

Solve the given system

1.

$$x' = x - y$$

$$y' = 4x - 3y$$

2.

$$x' = 5x - 3y$$

$$y' = 3x - y$$

Problem 5

Solve the given system

1.

$$\begin{aligned}x' &= -x + 2y \\ y' &= -x - 3y\end{aligned}$$

2.

$$\begin{aligned}x' &= -3x - y, x(\pi) = 1 \\ y' &= 2x - y, y(\pi) = -1\end{aligned}$$