

AMAT 3260 assignment #6, due April 2

Problem 1 Find general solution of the system of equations. Sketch few trajectories in the phase space of the system. Is the zero solution stable or unstable?

$$1. \begin{cases} x'_1 = 3x_1 - 2x_2 \\ x'_2 = 2x_1 - 2x_2 \end{cases}$$

$$2. \begin{cases} x'_1 = -2x_1 + x_2 \\ x'_2 = x_1 - 2x_2 \end{cases}$$

$$3. \begin{cases} x'_1 = \frac{5}{4}x_1 + \frac{3}{4}x_2 \\ x'_2 = \frac{3}{4}x_1 + \frac{5}{4}x_2 \end{cases}$$

$$4. \begin{cases} x'_1 = 4x_1 - 3x_2 \\ x'_2 = 8x_1 - 6x_2 \end{cases}$$

Problem 2 Find general solution as a real valued function. Sketch the phase portrait of the system.

$$1. \begin{cases} x'_1 = -x_1 - 4x_2 \\ x'_2 = x_1 - x_2 \end{cases}$$

$$2. \begin{cases} x'_1 = 3x_1 - 2x_2 \\ x'_2 = 4x_1 - x_2 \end{cases}$$

$$3. \begin{cases} x'_1 = x_1 + 2x_2 \\ x'_2 = -5x_1 - x_2 \end{cases}$$

Problem 3 Find general solution. Sketch few trajectories.

$$1. \begin{cases} x'_1 = 3x_1 - 4x_2 \\ x'_2 = x_1 - x_2 \end{cases}$$

$$2. \begin{cases} x'_1 = -\frac{3}{2}x_1 + x_2 \\ x'_2 = -\frac{1}{4}x_1 - \frac{1}{2}x_2 \end{cases}$$

Problem 4 Solve initial value problem.

$$1. \begin{cases} x'_1 = 2x_1 + 1.5x_2 \\ x'_2 = -1.5x_1 - x_2 \end{cases} \quad x_1(0) = 3, \quad x_2(0) = -2.$$

$$2. \begin{cases} x'_1 = x_1 - 5x_2 \\ x'_2 = x_1 - 3x_2 \end{cases} \quad x_1(0) = 1, \quad x_2(0) = 1.$$

$$3. \begin{cases} x'_1 = -2x_1 + x_2 \\ x'_2 = -5x_1 + 4x_2 \end{cases} \quad x_1(0) = 1, \quad x_2(0) = 3.$$

Problem 5 Find general solution of non-homogeneous linear system.

$$1. \begin{cases} x'_1 = 2x_1 - x_2 + e^t \\ x'_2 = 3x_1 - 2x_2 + t \end{cases}$$

$$2. \begin{cases} x'_1 = x_1 + \sqrt{3}x_2 + e^t \\ x'_2 = \sqrt{3}x_1 - x_2 + \sqrt{3}e^{-t} \end{cases}$$