# Math 308 Quiz 9

Due: Friday, April 12, 2024

**Name:** _____ **UIN:** _____

**Directions:** Please upload a PDF file of your solutions on Gradescope by Friday 12 April at 10pm. You may discuss in groups but please submit your own work.

1. Using the eigenvalue method, solve the following systems of differential equations

   (a) (5 points)

$$x' = \begin{pmatrix} 1 & -2 \\ 3 & -4 \end{pmatrix} x, \quad x(0) = \begin{pmatrix} 3 \\ 1 \end{pmatrix}$$

   (b) (5 points)

$$x' = \begin{pmatrix} 5 & -1 \\ 3 & 1 \end{pmatrix} x, \quad x(0) = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$$

2. (5 points) Using the eigenvalue method, solve the following system

$$x' = \begin{pmatrix} -2 & -3 \\ 3 & -2 \end{pmatrix} x, \quad x(0) = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$$

3. (5 points) Reduce the given third order differential equation to a system of first order equations. Then write the system of equations in matrix form of the form $x' = Ax + f$ where $A$ is a $3 \times 3$ matrix, $x$ is a $3 \times 1$ vector and $f$ is a $3 \times 1$ vector.

$$y''' + 3ty'' + 3t^2y' + y = 7$$