Homework 4
Due Friday, February 3rd at 11:59pm

1 Problem 1
a. Find the general solution to the equation
\[
\frac{dy}{dt} = \begin{bmatrix} -2 & 1 \\ 1 & -2 \end{bmatrix} y
\]

b. Fund the solution to the above equation with the initial condition
\[
y_0 = \begin{bmatrix} 3 \\ 1 \end{bmatrix}
\]

2 Problem 2
Solve the system numerically for \( t \in [0, 1] \) using the Matlab ODE solver. Submit the plot of the function.

3 Problem 3
Solve the above system numerically using the Forward Euler scheme. Use \( N = 10, 100, 1000, 10000 \) and submit the plot indicating the rate of convergence.

3.1 Problem 4
Solve the above system numerically using the Trapezoid scheme. Use \( N = 10, 100, 1000, 10000 \) and submit the plot indicating the rate of convergence.