

Name: _____

Directions: Show all work. No credit for answers without work.

1. [4 points] Using real numbers, find the general solution to $\mathbf{x}' = \begin{bmatrix} -9 & -4 \\ 9 & 3 \end{bmatrix} \mathbf{x}$.

2. [3 points] Convert $x^{(3)} + 2x'' + 5x = 0$ to a system of first-order differential equations. Your system should be as small as possible. Do not attempt to solve.

3. [3 points] Let $f(x) = \begin{cases} -1 & \text{if } -1 < x < 0 \\ 1 & \text{if } 0 < x < 1 \end{cases}$ with $f(x+2) = f(x)$. Find the Fourier Series for $f(x)$. Simplify your expression as much as possible.