

Show all work. 10 points.

1. Find the eigenvalues and eigenfunctions of  $y'' + \lambda y = 0$ ,  $y'(0) = 0$  and  $y'(\pi) = 0$ .

2. Find the general solution of the system below.

$$\begin{aligned}\frac{dy}{dt} &= -4x + 2y \\ \frac{dx}{dt} &= -\frac{5}{2}x + 2y\end{aligned}$$

Hint:  $\begin{bmatrix} 2 \\ 1 \end{bmatrix}$  and  $\begin{bmatrix} 2 \\ 5 \end{bmatrix}$  are eigenvectors.