

1. Use LaPlace Transform techniques to solve the differential equation

$$y'' + 4y = 0; y(0) = 1, y'(0) = 1$$

2. Use LaPlace Transform techniques to solve the differential equation

$$y'' + 4y = 4t^2 - 4t + 10; y(0) = 0, y'(0) = 3$$

3. Solve the following initial value problem using Laplace Transform techniques

$$w'' + w = u(t - 2) - u(t - 4), w(0) = 1, w'(0) = 0$$

4. Solve the differential equation

$$y(t) + \int_0^t e^{t-v} y(v) dv = \sin t$$

5. Solve the differential equation

$$y'' - 4y' + 5y = g(t); y(0) = 0, y'(0) = 1$$

6. Solve the following differential equation

$$y'' + 2y' + 2y = \delta(t - \pi), y(0) = 1, y'(0) = 1$$

Solve the matrix system  $x' = Ax$ , with  $A = \begin{bmatrix} -1 & 1 & 0 \\ 1 & 2 & 1 \\ 0 & 3 & -1 \end{bmatrix}$ .

Solve the matrix system  $x' = Ax$ , with  $A = \begin{bmatrix} -1 & 2 \\ -1 & -3 \end{bmatrix}$ .

Solve the matrix system  $x' = Ax$ , with  $A = \begin{bmatrix} 2 & -3 \\ 1 & -2 \end{bmatrix}$ .