

- (1) (15%) Find the solution of the initial-value problem

$$x''(t) + 16x(t) = 0, \text{ with } x(\pi/2) = -2 \text{ and } x'(\pi/2) = 1$$

- (2) (15%) Solve

$$\frac{dy(x)}{dx} - 3y(x) = 6$$

- (3) (20%) Solve the boundary-value problem

$$y''(t) + \lambda^2 y(t) = 0, \text{ with } y(0) = 0 \text{ and } y(L) = 0 \text{ where } \lambda > 0$$

- (4) (15%) Solve

$$2x_1 + 6x_2 + x_3 = 7$$

$$x_1 + 2x_2 - x_3 = -1$$

$$5x_1 + 7x_2 - 4x_3 = 9$$

- (5) (20%) Find the eigenvalues and eigenvectors of

$$\begin{bmatrix} 1 & 2 & 1 \\ 6 & -1 & 0 \\ -1 & -2 & -1 \end{bmatrix}$$

- (6) (15%) Find the inverse of

$$\begin{bmatrix} 2 & 0 & 1 \\ -2 & 3 & 4 \\ -5 & 5 & 6 \end{bmatrix}$$