1. Solve \( y'' - y' - 2y = \sin x \).

2. Solve \( y''' + 2ky' + (k^2 + k^2)y = 0 \)

3. \( f(t) = t \sin(\omega t) \), find its Laplace transform

4. Find the eigenvalues and eigenvectors of the matrix \( A = \begin{bmatrix} 1 & 0 & \sqrt{2} \\ 0 & 2 & 0 \\ \sqrt{2} & 0 & 0 \end{bmatrix} \).

5. \( A=[1, 1, 1], B=[3, -1, 2], C=[2, 1, 4], \) and \( D=[3, 3, 10] \) are vectors in (a) & (b) and points in (c).
   (a) Find the angle between \( A \) and \( B \).
   (b) Find the component of \( A \) in the direction of \( B \).
   (c) Find the volume of a tetrahedron with the vertices at points \( A, B, C, D \).