

1. Find the Integral

$$\int_{(2,0,1)}^{(4,4,0)} [2x(y^3 - z^3)dx + 3x^2y^2dy - 3x^2z^2dz]$$

2. Under what conditions for the constants A, B, C, D is

$(Ax+By)dx + (Cx+Dy)dy=0$ exact? Solve the exact equation.

3. Solve $x^2y'' + xy' - 4y = \frac{1}{x^2}$

4. Solve

$$y'' + 5y' + 6y = \delta(t - \frac{1}{2}\pi) + u(t - \pi) \cos t$$

$$y(0) = 0, y'(0) = 0$$

5. Find the eigenvalues and the eigenvectors

$$\begin{bmatrix} -3 & 0 & -2 & 8 \\ 0 & 1 & 4 & -2 \\ -4 & 10 & -1 & -2 \\ 6 & -4 & -2 & 3 \end{bmatrix}$$