

1. Solve $\frac{dy}{dt} - y = 1$ by a series method. (20)
2. Given a periodic function with a period of 2 as follows:
 $f(x) = 1, 0 < x < 1; f(x) = 0, -1 < x < 0$. Find the following Fourier series parts: (20)
 - a. a_0
 - b. a_n
 - c. b_n
 - d. $f(0)$
3. Find the eigenvalues and eigenvectors of $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$. Verify whether the eigenvectors are orthogonal or not. (20)
4. Solve $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = x^2$ (20)
5. Given three vectors, $\vec{v}_1 = (1,1,1)$, $\vec{v}_2 = (1,0,1)$ and $\vec{v}_3 = (1,-1,0)$. Find the volume formed by these vectors. (10)
6. Find the Taylor series expansion for x^2y about $(x,y) = (0,0)$ (10)