

3. Solve $x(1 - x^2) \frac{dy}{dx} + (2x^2 - 1)y = x^3$
4. a) Using method of variation of parameters, solve $\frac{d^2y}{dx^2} - 2 \frac{dy}{dx} + y = e^x \log x$.
 b) Solve $y'' + 6y' + 13y = 0, y(0) = 3, y'(0) = -1$.
5. Solve $x^2 \frac{d^2y}{dx^2} + 3x \frac{dy}{dx} + y = \frac{1}{(1-x)^2}$

SECTION-C

6. a) Evaluate $\oint_C \frac{e^z}{(z^2 + \pi^2)^2} dz$ where C is $|z| = 4$.
 b) Find Laurent's expansion of $f(z) = \frac{7z-2}{(z+1)z(z-2)}$ in region $1 < z + 1 < 3$.
7. If $\frac{(1+i)^{x+iy}}{(1-i)^{x-iy}} = \alpha + i\beta$, prove that one of the values of $\tan^{-1} \frac{\beta}{\alpha} = \frac{1}{2} \pi x + y \log 2$.
8. Find the residue of $f(z) = \frac{z^3}{(z-1)^4(z-2)(z-3)}$ at its poles and evaluate $\oint_C f(z) dz$, where C is the circle $|z| = 2.5$.
9. Find the analytic function whose real part is $e^{2x}(x \cos 2y - y \sin 2y)$.

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