

Bapuji Educational Association (Regd.)
BAPUJI INSTITUTE OF ENGINEERING AND TECHNOLOGY, DAVANAGERE-04
DEPARTMENT OF MATHEMATICS

Assignment - 1 (Covers Module-1 & 2)

Sub: Calculus and Differential Equations (21MAT11)

1. Find the angle between Radius vector & tangent to the curve $r^m \cos m\theta = a^m$.
2. Find the angle of intersection between curves $r = \frac{a}{1+\cos\theta}$ and $r = \frac{b}{1-\cos\theta}$.
3. Find the Pedal equation of the curve $\frac{2a}{r} = (1 + \cos\theta)$.
4. Find the radius of curvature for the curve $x^2y = a(x^2 + y^2)$ at the point $(-2a, 2a)$.
5. Find the Radius of curvature of the curve $y^2 = \frac{a^2(a-x)}{x}$ where the curve meets x-axis.
6. Find the Radius of curvature for the curve $r = a(1 + \cos\theta)$.
7. Expand $\tan^{-1}x$ in powers of $(x - 1)$ upto fourth degree terms.
8. Using Maclaurin's series expand $\log(1 + e^x)$ upto term containing x^4 .
9. Evaluate a) $\lim_{x \rightarrow 0} \left(\frac{a^x + b^x + c^x + d^x}{4} \right)^{\frac{1}{x}}$ b) $\lim_{x \rightarrow 0} \left(\frac{\sin x}{x} \right)^{\frac{1}{x^2}}$ c) $\lim_{x \rightarrow 0} \left(\frac{(1+x)^{1/x} - e}{x} \right)$
10. If $u = f(x - y, y - z, z - x)$ then Show that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$.
11. If $u = x^2 + y^2 + z^2, v = xy + yz + zx, w = x + y + z$ then find $J \begin{pmatrix} u, v, w \\ x, y, z \end{pmatrix}$.
12. Find the extreme values of the function $f(x, y) = x^3y^2(1 - x - y)$ for $x, y \neq 0$.


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Assignment - 2 (Covers Module-3, 4 & 5)

Sub: Calculus and Differential Equations (21MAT11)

1. Solve $y(2x - y + 1)dx + x(3x - 4y + 3)dy = 0$
2. Solve $(y \log x - 2)ydx = xdy$.
3. Solve $\frac{dy}{dx} + x \sin 2y = x^3 \cos^2 y$.
4. Find the orthogonal trajectory of the family $r^n \cos n\theta = a^n$.
5. A body originally at 80°C cools to 60°C in 20 minutes the temperature of air being 40°C . What will be the temperature of the body after 40 minutes?
6. Solve $p^2 - 2p \sinh x - 1 = 0$.
7. Solve $(px - y)(py + x) = 2p$ by reducing into Clairaut's form taking substitution $X = x^2, Y = y^2$.
8. Solve i) $(4D^4 - 8D^3 - 7D^2 + 11D + 6)y = 0$ ii) $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = e^{2x} + \cos x + 4$.
9. Solve $y'' + 4y = \tan 2x$ by the method of variation of parameter.
10. Solve $x^2y'' - 5xy' + 8y = 2 \log x$.
11. Solve $(1+x)^2 \frac{d^2y}{dx^2} + (1+x) \frac{dy}{dx} + y = 2 \sin[\log(1+x)]$.
12. Find the Rank of the matrix $A = \begin{bmatrix} 1 & 0 & 2 & 1 \\ 0 & 1 & -2 & 1 \\ 1 & -1 & 4 & 0 \\ -2 & 2 & 8 & 0 \end{bmatrix}$ by reducing it into Echelon form.
13. For what values of λ and μ the system of equations $x + y + z = 6, x + 2y + 3z = 10, x + 2y + \lambda z = \mu$ may have i) Unique solution ii) Infinite number of solution iii) No solution.
14. Solve the system of equations $x + y + z = 9, x - 2y + 3z = 8, 2x + y - z = 3$ by Gauss elimination method.
15. Solve the system of equations by Gauss Seidel Method
 $x + y + 54z = 110, 27x + 6y - z = 85, 6x + 15y + 2z = 72$.
16. Find the Largest Eigen value and the corresponding Eigen vector of

$$A = \begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix} \text{ using power method. Take } [1, 0, 0]^T \text{ as initial vector.}$$

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