

2 marks

UN16-4

1. If $x = at^2$ and $y = 2at$. Find $\frac{dy}{dx}$.
2. If $y = (ax+b)^m$. Find y_n .
3. Write the formula for radius of curvature.
4. Find n^{th} derivative of $\sin 2x \cos 3x$.
5. If $x = r \cos \theta$; $y = r \sin \theta$. Find $\frac{\partial(x, \theta)}{\partial(x, y)}$.
6. State Leibnitz Theorem.
7. Write the formula for finding angle between two curves.
8. What are the maximum and minimum of $x + \frac{1}{x}$.
9. Find $\lim_{x \rightarrow 0} \frac{\sin mx}{\sin nx}$.
10. Find the eq of the tangent at $(2, -12)$ on the curve $y = 4x - 3x^2 - x^3$.
11. If $u = xy + \sin xy$. Find $\frac{\partial^2 u}{\partial x \partial y}$.
12. Define envelope.
13. If $y = \cos^{-1} \left(\frac{1-x^2}{1+x^2} \right)$. Find $\frac{dy}{dx}$.
14. Find $\lim_{x \rightarrow 2} \frac{x^2-4}{x-2}$.
15. Evaluate $\lim_{x \rightarrow 0} \frac{e^x - 1}{x}$.
16. Differentiate $\frac{ax+b}{cx+d}$.
17. Write the n^{th} derivative of $\log(ax+b)$.
18. Differentiate e^{x^2+2x+3} .
19. Find the maximum and minimum value of $x^3 - 18x^2 + 96x + 4$.

5 marks

20. State and Prove Leibnitz Theorem.
21. Find the n^{th} derivative of $e^{ax} \cos x \sin x$.
22. If $x^2 = x^2 + y^2$. ST $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = \frac{1}{x} \left[\left(\frac{\partial z}{\partial x} \right)^2 + \left(\frac{\partial z}{\partial y} \right)^2 \right]$
23. PT $\sin^2 x \frac{d^2 y}{dx^2} = (m^2 \cos^2 x - m)y$, If $y = a \sin^m x$.
24. If $f = a \tan^{-1} \left(\frac{x}{y} \right)$. Verify that $\frac{\partial^2 f}{\partial x \partial y} = \frac{\partial^2 f}{\partial y \partial x}$.

25. Find the eq of the tangent and normal to the curve $y^2 = \frac{x^3}{4-x}$ at the point $(2, 8)$.

26. If $u = \sqrt{x^2 + y^2}$. ST $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = u$.

27. Find the angle between the curves $y^2 = 4x$ and $x^2 = 4y$.

28. If $u = \log(x^3 - y^3 + z^3 - 3xyz)$. PT $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = \frac{3}{x+y+z}$.

29. Find the eq of the tangent and normal at $(2, -2)$ on $y^2 = \frac{x^3}{4-x}$.

10 marks

30. If $y = \sin^{-1} x$. PT $(1-x^2)y_2 - xy_1 = 0$, and $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - n^2y_n = 0$.
31. If $y = a \cos(\log x) + b \sin(\log x)$. PT $x^3 y_{n+2} + (2n+1)xy_{n+1} + (n^2+1)y_n = 0$.
32. If $y = \log(x + \sqrt{1+x^2})$. PT $(1+x^2)y_{n+2} + (2n+1)xy_{n+1} + n^2y_n = 0$.
33. If $y = e^{a \sin^{-1} x}$. PT $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - (n^2+a^2)y_n = 0$.
34. Verify Euler's Theorem for the function $u = x^3 + y^3 + z^3 + 3xyz$.
35. If $y = \log(x + \sqrt{1+x^2})$. Find $y_n(0)$.
- 36.