



MATHS

BOOKS - MODERN PUBLICATION

APPLICATIONS OF DERIVATIVES

Problem

1. For what value of a , $f(x) = \log_a(x)$ is increasing on \mathbb{R} ?

[Watch Video Solution](#)

2. Write the points at which tangent to the curve $Y = X^2 - 3X$ is parallel to X-axis



Watch Video Solution

3. If $y = e^x + e^{-x} + 2$ has a tangent parallel to x-axis at (α, β) then find the value of α .



Watch Video Solution

4. Write slope of the tangent to the curve

$$y = \sqrt{3} \sin x + \cos x \text{ at } \left[\frac{\pi}{3}, 2 \right]$$



Watch Video Solution

5. Is $f(X) = 20 - X - \cos X$, increasing always? Justify your answer.



Watch Video Solution

6. State where $y = \sin x$ attains a maximum value in the interval $[0, \pi]$.



Watch Video Solution

7. Find the value of X for which $f(X)$ is either a local maximum or a local minimum when $f(X) = X^3 - 3X^2 - 9X + 6$.



Watch Video Solution

8. State where $y = \sin x$ attains a maximum value in the interval $[0, \pi]$.



Watch Video Solution

9. Find the point on the curve, $y = 2x^2 - 6x - 4$ at which the tangent is parallel to x-axis



Watch Video Solution

10. For what values of x , $f(x) = x^3 - 12x$ is increasing.



Watch Video Solution

11. Find the maximum and minimum of

$$f(X) = 3 + |X - 2| \text{ in } -2 \leq X \leq 5.$$



Watch Video Solution

12. For what value of k , $f(x) = kx^3 + 3$ is decreasing?



Watch Video Solution

13. Write the absolute maximum and absolute minimum of the function $f(x) = \frac{x}{|x|}$ in $[-2, 2]$.



Watch Video Solution

14. Find the equation of tangent to the curve $x = y^2 - 2$ at the points where slope of the normal equal to (-2) .



Watch Video Solution

15. $f(x) = x^4 - 63x^2 + ax + 9$ attains its maximum value at $x = 1$ in the interval $[0,2]$. Find the value of 'a'.



Watch Video Solution

16. Find the points on the curve $9y^2 = x^3$ where the normal to the curve makes equal intercepts on the axes.



Watch Video Solution

17. Find the equation of normal to the circle $x^2 + y^2 = 5$ at $(2,1)$.



Watch Video Solution

18. Find the intervals where the function $f(x) = \tan x - 4(x - 2)$ is increasing and decreasing on $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$



Watch Video Solution

19. Show that for $f(x) = x + \frac{1}{x}$ the local maximum is less than local minimum.



Watch Video Solution

20. Find the points on the curve $9y^2 = x^3$ where the normal to the curve makes equal intercepts on the axes.



Watch Video Solution

21. Find the point (S) on the curve

$$x = \frac{3at}{1+t^2}, y = \frac{3at^2}{1+t^2}$$

where the tangent is perpendicular to the line $4x+3y+5=0$.



Watch Video Solution

22. Find the equation of the tangent and normal to $\left[\frac{x}{a}\right]^{\frac{1}{3}} + \left[\frac{y}{b}\right]^{\frac{1}{3}} = 1$ at $(a\cos^3\theta, b\sin^3\theta)$.



Watch Video Solution

23. Show that the function $\frac{e^x}{x^p}$ is strictly increasing for $x > p > 0$.



Watch Video Solution

24. Show that $\frac{x}{1+x \tan x}, x \in \left(0, \frac{\pi}{2}\right)$ is maximum when $x = \cos x$.



Watch Video Solution

25. Find the extreme values of $y = \cos x(1+\sin x)$, x in $[0, 2\pi]$



Watch Video Solution

26. Find the equation of normal to the curve $x^3 = 4y$ which passes through $(1, 2)$.



Watch Video Solution

27. Prove that $y = mx + c$ touches the parabola $y^2 = 4ax$ if $a = mc$.



Watch Video Solution

28. If $f(x) = a \ln x + bx^2 + x$ has extreme values at $x = -1$ and $x = 2$ then find a and b .



Watch Video Solution

29. Find the intervals where the following functions are (a) increasing and (b) decreasing.

$$y = \begin{cases} x^2 + 1 & x \leq -3 \\ x^3 - 8x + 13 & x > -3 \end{cases}$$



Watch Video Solution

30. Find extreme value of

$$f(x) = \begin{cases} \frac{x}{1-x^2} & -1 < x < 0 \\ x^3 - x & 0 \leq x < 2 \end{cases} \quad \text{on } (-1, 2)$$



Watch Video Solution

31. Find the values of x for which $f(x) = x^4 + 2x^3 - 2x^2 - 6x + 5$ is locally maximum and minimum.



Watch Video Solution

32. Show that the tangent to the curve $y = x^2 + 3x - 2$ at $(1,2)$ is parallel to tangent at $(-1,1)$ to the curve $y = x^3 + 2x$.



Watch Video Solution

33. Find the altitude of a right circular cylinder of maximum volume inscribed in a sphere of radius r .



Watch Video Solution

34. Show that $y = mx + c$ is a tangent to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ if $c^2 = a^2 m^2 + b^2$



Watch Video Solution

35. A square piece of tin of side 18 cm is to be made into a box without top by cutting a square from each corner and folding up the flaps to form a box. What should be the side of the square to be cut off so that the volume of the box is maximum? Also find the maximum volume.



Watch Video Solution

36. Show that the equation of the normal to $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$ is $y \cos \theta - x \sin \theta = a \cos 2\theta$ where θ is the inclination of the normal to x-axis.



Watch Video Solution

37. Find the interval where

$$y = \sin 2x - \cos 2x, x \in [0, 2\pi] \text{ is}$$

(a) increasing (b) decreasing



Watch Video Solution

38. A cylindrical vessel of capacity 500 cubic metres open at the top is to be constructed. Find the dimensions of the vessel if the material used is minimum given that the thickness of the material used is 2 cm.



Watch Video Solution

39. Find the points on the curve $y = x^2 + 1$ which are nearest to the point (0,2).



Watch Video Solution

40. Find the condition that the line $x \cos \alpha + y \sin \alpha = P$ may be a tangent to the curve $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.



Watch Video Solution

41. Show that the semi-vertical angle of a right circular cone of minimum volume that circumscribes a given sphere is $\sin^{-1} \left(\frac{1}{3} \right)$.



Watch Video Solution

42. If $x \cos \alpha + y \sin \alpha = p$ is a tangent to the curve

$$\left(\frac{x}{a}\right)^{\frac{n}{n}-1} + \left(\frac{y}{b}\right)^{\frac{n}{n}-1} = 1 \text{ then so that}$$

$$(a \cos \alpha)^n + (b \sin \alpha)^n = p^n.$$



Watch Video Solution