



MATHS

BOOKS - ACCURATE PUBLICATION

APPLICATIONS OF DERIVATIVES

Example

1. Find the equation of the tangent and normal to the given curves at the points given

:

$$y = x^3 \text{ at } (1, 1), (-1, -1)$$



Watch Video Solution

2. Find the equation of the tangent and normal to the given curves at the points given

:

$$y = x^3 \text{ at } (2, 8)$$



Watch Video Solution

3. Find the point on the curve $y = x^3 - 2x^2 - 2x$ at which the tangent lines are parallel to the line $y = 2x - 3$.



[Watch Video Solution](#)

4. Find the points on the curve $y = x^3 - 2x^3 - x$ at which the tangent lines are parallel to the line $y = 3x - 2$.



[Watch Video Solution](#)

5. Find the equation of the tangent to the curve $x^2 + 3xy = 3$, which is parallel to the line $y - 4x + 5 = 0$.



[Watch Video Solution](#)

6. Find the equation of the tangent to the curve $y = \sqrt{3x - 2}$ which is parallel to the line $4x - 2y + 5 = 0$.



[Watch Video Solution](#)

7. Find the equation of the tangent to the curve $y = 2x^2 + 7$, which is perpendicular to the line $x + 4y + 5 = 0$.



[Watch Video Solution](#)

8. Find the equation of the tangent to the curve $y = x^2 + 4x + 6$, which is perpendicular to the line $x - y + 1 = 0$.



[Watch Video Solution](#)

9. Find the equation of the tangent to the curve $x^2 + 4y = 4$, which is perpendicular to the line $x - y + 5 = 0$.



[Watch Video Solution](#)

10. Find the equation of the tangents to the function $y = x^3 + 2x + 6$, which are perpendicular to the line $14y + x + 4 = 0$.



[Watch Video Solution](#)

11. Find the equation of the tangents to the function $y = 4x^3 - 3x + 5$ which are perpendicular to the line $-2x + y + 5 = 0$.



[View Text Solution](#)

12. Find the equation of the tangent line to the curve $y = x^2 - 2x + 7$ which is parallel to the line $2x - y + 4 = 0$



[Watch Video Solution](#)

13. Find the equation of the tangent to the curve $y = x^2 - 2x + 9$, which is parallel to the line $2x - y + 9 = 0$.



Watch Video Solution

14. Find the equation of the tangent to the curve $y = x^2 - 3x + 7$ which is parallel to the line $3x - y + 4 = 0$.



Watch Video Solution

15. Find the equation of the tangent to the curve $y = x^2 - 4x + 11$ which is parallel to the $4x - y + 7 = 0$.



[Watch Video Solution](#)

16. Find the equation of the tangent line to the curve $y = x^2 + 6x + 7$ where tangent is parallel to the line $8x - 2y + 10 = 0$.



[Watch Video Solution](#)

17. Find the equation of the tangent line to the curve $y = x^2 - 4x + 4$ where tangent is parallel to the line $4x - 4y - 6 = 0$.



Watch Video Solution

18. Find the equation of tangent to the curves

$\frac{x^2}{16} + \frac{y^2}{9} = 1$ which is parallel to x-axis.



Watch Video Solution

19. Find the equation of tangent to the curve

$y = 3x^2 - 2x + 5$ which is parallel to the line

$$4x - y = 8.$$



Watch Video Solution

20. Find the equation of normal to the curve :

$y = 5x^2 - 10x + 11$, where normal is parallel

to the line $x - 2y + 10 = 0$



Watch Video Solution

21. Find the equation of normal to the curve :

$$y = x^3 + x^2 - 11x + 15, \text{ where normal is}$$

parallel to the line $x - 3y + 1 = 0$



[Watch Video Solution](#)

22. Find the equation of normal to the curve

$$y = x^3 - 7x^2 - 20x + 1 \text{ where normal is}$$

parallel to the line $x + 4y + 7 = 0$.



[Watch Video Solution](#)

23. Find the intervals in which the function f given by $f(x) = 2x^3 - 3x + 5$ is strictly increasing



Watch Video Solution

24. Find the intervals in which the function f given by $f(x) = 2x^3 - 3x + 5$ is strictly decreasing



Watch Video Solution

25. Find the intervals in which the function :

$$f(x) = 4 - 9x - 2x^2 \text{ is}$$

strictly increasing



Watch Video Solution

26. Find the intervals in which the function :

$$f(x) = 4 - 9x - 2x^2 \text{ is}$$

strictly decreasing



Watch Video Solution

27. Find the intervals in which the function $f(x) = 10 - 6x - 2x^2$ is strictly increasing.



[Watch Video Solution](#)

28. Find the intervals in which the function $f(x) = x^3 - 6x^2 + 9x + 8$ is strictly increasing.



[Watch Video Solution](#)

29. Find the interval in which the function 'f' defined by $f(x) = 2x^3 - 8x^2 + 10x + 3$ is strictly decreasing



Watch Video Solution

30. Find the interval in which the function 'f' defined by $f(x) = 2x^3 - 8x^2 + 10x + 3$ is strictly increasing



Watch Video Solution

31. Find the intervals in which the function $f(x) = 2x^3 - 9x^2 + 12x + 5$ is strictly increasing.



[Watch Video Solution](#)

32. Find the intervals in which the function $f(x) = 2x^3 - 15x^2 + 36x + 1$ is strictly increasing



[Watch Video Solution](#)

33. Find the intervals in which the function $f(x) = 2x^3 - 12x^2 + 18x + 5$ is strictly increasing.



Watch Video Solution

34. Find the intervals in which the function : $f(x) = x^3 + 3x^2 - 105x + 25$ is strictly increasing



Watch Video Solution

35. Find the intervals in which the function

$$f(x) = x^3 + 3x^2 - 105x + 25$$

is strictly decreasing



[View Text Solution](#)

36. Find the intervals in which the function

$$f(x) = 30 - 24x + 15x^2 - 2x^3$$

is strictly decreasing.



[Watch Video Solution](#)

37. Find the intervals in which the function $f(x) = 20 - 12x + 9x^2 - 2x^3$ is strictly decreasing.



View Text Solution

38. Find the intervals in which the function $f(x) = 17 - 18x + 12x^2 - 2x^3$ is strictly decreasing,



Watch Video Solution

39. Find the intervals in which the function :

$$f(x) = 20 - 9x + 6x^2 - x^3 \quad \text{is strictly}$$

increasing.



Watch Video Solution

40. Find the intervals in which the function :

$$f(x) = 20 - 9x + 6x^2 - x^3 \quad \text{is strictly}$$

decreasing.



Watch Video Solution

41. Find the intervals in which the following functions are strictly increasing or strictly decreasing :

$$6 + 12x + 3x^2 - 2x^3$$



Watch Video Solution

42. Find the intervals in which the following functions are strictly increasing or strictly decreasing :

$$f(x) = 2x^3 - 9x^2 + 12x + 30$$





[Watch Video Solution](#)

43. Find the intervals in which the following functions are strictly increasing or strictly decreasing :

$$f(x) = 2x^3 - 3x^2 - 36x + 7$$



[Watch Video Solution](#)

44. Find the intervals in which the function given by $f(x) = \sin x + \cos x, 0 \leq x \leq 2\pi$ is strictly increasing.



[Watch Video Solution](#)

45. Two sides of a triangle are x and y . Find the angle between them such that area shall be maximum.



[Watch Video Solution](#)

46. Show that of all rectangles with given perimeter square has maximum area



[Watch Video Solution](#)

47. Of all rectangles , each of which has perimeter: 60 cm . Find the one having maximum area. Also find that area.



Watch Video Solution

48. Of all rectangles , each of which has perimeter: 60 cm . Find the one having maximum area. Also find that area.



Watch Video Solution

49. Of all rectangles , each of which has perimeter: 60 cm . Find the one having maximum area. Also find that area.



[Watch Video Solution](#)

Questions Carrying 1 Mark Type I

1. The slope of the tangent to the curve $y = 4 - x^2$ at $x = 1$ is

A. 1

B. -2

C. 2

D. 3

Answer: B



Watch Video Solution

2. The slope of tangent to the curve

$$y = 3 - x^2 \text{ at } x = 1 \text{ is}$$

A. 1

B. -2

C. 2

D. 3

Answer: B



Watch Video Solution

3. The slope of the tangent to the curve

$x = t^2 + 3t - 8, y = 2t^2 - 2t - 5$ at the

point (2,-1) is:

A. $\frac{22}{7}$

B. $\frac{6}{7}$

C. $\frac{7}{6}$

D. $\frac{-6}{7}$

Answer: B



Watch Video Solution

4. The slope of the normal to the curve

$y = 2x^2 + 3 \sin x$ at $x = 0$ is:

A. 3

B. $\frac{1}{3}$

C. -3

D. $-\frac{1}{3}$

Answer: D



Watch Video Solution

5. The line $y = x + 2$, is a tangent to the curve

$y^2 = 4x$ at the point :

A. (2, 1)

B. (0, 2)

C. (1, 2)

D. (-1, 2)

Answer: B



Watch Video Solution

6. The line $y = x + 1$, is a tangent to the curve

$y^2 = 4x$ at the point :

A. (1, 2)

B. (2, 1)

C. (1, -2)

D. (1, 2)

Answer: A



Watch Video Solution

7. The normal at the point (1,1) on the curve

$$2y + x^2 = 3 \text{ is:}$$

A. $x + y = 0$

B. $x - y = 0$

C. $x + y + 1 = 0$

D. $x - y = 2$

Answer: B



Watch Video Solution

8. The points on the curve $9y^2 = x^3$, where the normal to the curve makes equal intercepts with the axes are:

A. $\left(4, \pm \frac{8}{3}\right)$

B. $\left(4, \frac{-8}{3}\right)$

C. $\left(4, \pm \frac{3}{8}\right)$

D. $\left(\pm 4, \frac{3}{8}\right)$

Answer: A



Watch Video Solution

9. On which of the following intervals is the function 'f' given by $f(x) = x^{100} + \sin x - 1$ strictly increasing?

A. $(0, 1)$

B. $\left(\frac{\pi}{2}, \pi\right)$

C. $\left(0, \frac{\pi}{2}\right)$

D. None of these

Answer: D



Watch Video Solution

10. The interval in which $y = x^2 e^{-x}$ is strictly increasing is

A. $(-\infty, 2)$

B. $(-2, 0)$

C. $(2, \infty)$

D. $(0, 2)$

Answer: D



Watch Video Solution

11. The interval for which the function

$f(x) = x^2 - 4x - 5$, is strictly increasing is :

A. $(2, \infty)$

B. $(-2, 2)$

C. $(-\infty, 2)$

D. $(-2, \infty)$

Answer: A



Watch Video Solution

12. The abscissa of the point on the curve $3y = 6x - 5x^3$, the normal at which passes through origin is

A. 1

B. $\frac{1}{3}$

C. 2

D. $\frac{1}{2}$

Answer: A



Watch Video Solution

13. The two curves

$$x^3 - 3xy^2 + 2 = 0 \text{ and } 3x^2y - y^3 = 2$$

A. touch each other

B. cut at right angle

C. cut at angle $\frac{\pi}{3}$

D. cut at an angle $\frac{\pi}{4}$

Answer: B



Watch Video Solution

14. The tangent to the curve given by:

$$x = e^t \cos t, y = e^t \sin t \text{ at } t = \frac{\pi}{4} \text{ makes with}$$

x-axis an angle

A. 0

B. $\frac{\pi}{4}$

C. $\frac{\pi}{13}$

D. $\frac{\pi}{2}$

Answer: D



Watch Video Solution

15. The equation of the normal to the curve $y = \sin x$ at $(0,0)$ is

A. $x = 0$

B. $y = 0$

C. $x + y = 0$

D. $x - y = 0$

Answer: C



Watch Video Solution

16. The point on the curve $y^2 = x$, where the tangent makes an angle of $\frac{\pi}{4}$ with x-axis is

A. $\left(\frac{1}{2}, \frac{1}{4}\right)$

B. $\left(\frac{1}{4}, \frac{1}{2}\right)$

C. $(4, 2)$

D. $(1, 1)$

Answer: B



Watch Video Solution

17. The curve $y = x^{\frac{1}{5}}$ has at $(0, 0)$

A. a vertical tangent (parallel to y-axis)

B. a horizontal tangent (parallel to x-axis)

C. an oblique tangent

D. no tangent

Answer: A



Watch Video Solution

18. Find the equations of the normals to the curve: $3x^2 - y^2 = 8$, which are parallel to the line $x + 3y = 6$

A. $3x - y = 8$

B. $3x + y + 8 = 0$

C. $x + 3y \pm 8 = 0$

D. $x + 3y = 0$

Answer: C



Watch Video Solution

19. If the curve at $ay + x^2 = 7$ and $x^3 = y$, cut orthogonally at $(1, 1)$, then the value of a is :

A. 1

B. 0

C. -6

D. 6

Answer: D



Watch Video Solution

20. The equation of tangent to the curve

$y(1 + x^2) = 2 - x$, where it crosses x-axis is :

A. $x + 5y = 2$

B. $x - 5y = 2$

C. $5x - y = 2$

D. $5x + y = 2$

Answer: A



Watch Video Solution

21. The points at which the tangents to the curve $y = x^3 - 12x + 18$ are parallel to x-axis are :

A. $(2, -2), (-2, -34)$

B. $(2, 34), (-2, 0)$

C. $(0, 34), (-2, 0)$

D. $(2, 2), (-2, 34)$

Answer: D



Watch Video Solution

22. The tangent to the curve $y = e^{2x}$ at the point $(0, 1)$ meets x-axis at :

A. (0, 1)

B. $\left(-\frac{1}{2}, 0\right)$

C. (2, 0)

D. (0, 2)

Answer: B



Watch Video Solution

23. The slope of the tangent to the curve

$x = t^2 + 3t - 8, y = 2t^2 - 2t - 5at$ the

point (2,-1) is:

A. $\frac{22}{7}$

B. $\frac{6}{7}$

C. $-\frac{6}{7}$

D. -6

Answer: B



Watch Video Solution

24. The two curves

$$x^3 - 3xy^2 + 2 = 0 \text{ and } 3x^2y - y^3 = 2$$

A. $\frac{\pi}{4}$

B. $\frac{\pi}{3}$

C. $\frac{\pi}{2}$

D. $\frac{\pi}{6}$

Answer: C



Watch Video Solution

25. Find the intervals in which the following functions are (a) increasing (b) decreasing

$$f(x) = 2x^3 - 3x^2 - 12x + 4$$

A. $[-1, \infty)$

B. $[-2, -1]$

C. $(-\infty, -2)$

D. $[-1, 1]$

Answer: B



Watch Video Solution

26. Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be defined by

$f(x) = 2x + \cos x$, then f :

A. has a minimum at $x = \pi$

B. has a maximum at $x = 0$

C. is a decreasing function

D. is an increasing function

Answer: D



Watch Video Solution

27. $y = x(x - 3)^2$ decreases for the values of x given by :

A. $1 < x < 3$

B. $x < 0$

C. $x > 0$

D. $0 < x < \frac{3}{2}$

Answer: A



Watch Video Solution

28. The function

$$f(x) = 4 \sin^3 x - 6 \sin^2 x + 12 \sin x + 100$$
 is

strictly

A. increasing in $\left(\pi, \frac{3\pi}{2}\right)$

B. decreasing in $\left(\frac{\pi}{2}, \pi\right)$

C. decreasing in $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$

D. decreasing in $\left[0, \frac{\pi}{2}\right]$

Answer: B



Watch Video Solution

29. Which of the following function is strictly decreasing in $\left(0, \frac{\pi}{2}\right)$?

A. $\sin 2x$

B. $\tan x$

C. $\cos x$

D. $\cos 3x$

Answer: C



Watch Video Solution

30. The function $f(x) = \tan x - x$

A. always increases

B. always decreases

C. never increases

D. sometimes increase and sometimes
decreases

Answer: A



Watch Video Solution

31. If x is real, the maximum value of

$$x^2 - 8x + 17 \text{ is}$$

A. -1

B. 0

C. 1

D. 2

Answer: C



Watch Video Solution

32. The smallest value of polynomial

$x^3 - 18x^2 + 96x$ in $[0, 9]$ is

A. 128

B. 0

C. 135

D. 160

Answer: B



Watch Video Solution

33. The function $f(x) = 2x^3 - 3x^2 - 12x + 4$

, has

A. two points of local maximum

B. two points of local minimum

C. one maxima and one minima

D. no maxima or minima

Answer: C



Watch Video Solution

34. Find the maximum value of $\sin x \cos x$.

A. $\frac{1}{4}$

B. $\frac{1}{2}$

C. $\sqrt{2}$

D. $2\sqrt{2}$

Answer: B



Watch Video Solution

35. At $x = \frac{5\pi}{6}$, $f(x) = 2 \sin 3x + 3 \cos 3x$ is :

A. maximum

B. minimum

C. zero

D. neither maximum nor minimum

Answer: A



Watch Video Solution

36. Find the maximum slope of the curve:

$$y = -x^3 + 3x^2 + 2x - 27$$

A. 0

B. 12

C. 16

D. 32

Answer: B



Watch Video Solution

37. $f(x) = x^x$ has a stationary point at

A. $x = e$

B. $x = \frac{1}{e}$

C. $x = 1$

D. $x = \sqrt{e}$

Answer: B



Watch Video Solution

38. The maximum value of $\left(\frac{1}{x}\right)^x$ is :

A. 1) e

B. e^e

C. $e^{\frac{1}{e}}$

D. $\left(\frac{1}{e}\right)^{\frac{1}{e}}$

Answer: C



Watch Video Solution

Questions Carrying 1 Mark Type Ii

1. The values of a for which $y = x^2 + ax + 25$ touches the axis of x are



Watch Video Solution

2. If $f(x) = \frac{1}{4x^2 + 2x + 1}$, then its maximum value is



[Watch Video Solution](#)

3. Let f have second derivative at c such that $f'(c) = 0$ and $f''(c) > 0$, then c is a point of



[Watch Video Solution](#)

4. Minimum value of f if $f(x) = \sin x$ in $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ is

 [Watch Video Solution](#)

5. The maximum value of $\sin x + \cos x$ is

 [Watch Video Solution](#)

6. The curves

$$y = 4x^2 + 2x - 5 \text{ and } y = x^3 - x + 13$$

touch each other at the point



[Watch Video Solution](#)

7. The equation of normal to the curve

$$y = \tan x \text{ at } (0, 0) \text{ is } \dots$$



[Watch Video Solution](#)

8. The values of a for which the function $f(x) = \sin x - ax + b$ increases on \mathbb{R} are



Watch Video Solution

9. The function $f(x) = \frac{2x^2 - 1}{x^4}, x > 0$, decreases in the interval



Watch Video Solution

10. The least of the function

$$f(x) = ax + \frac{b}{x} \quad (a > 0, b > 0, x > 0) \quad \text{is}$$

..... .



[Watch Video Solution](#)

11. The slope of tangent to the curve

$$y = 2 - x^2 \text{ at } x = 1 \text{ is}$$



[Watch Video Solution](#)

12. The line $y = mx + 1$, is a tangent to the curve $y^2 = 4x$ if the value of m is:



Watch Video Solution

13. The line $y = x + 1$, is a tangent to the curve $y^2 = 4x$ at the point.



Watch Video Solution

14. The line $y = x - 1$, is a tangent to the curve $y^2 = 4x$ at the point :



Watch Video Solution

15. The normal to the curve $x^2 = 4y$ passing (1,2) is:



Watch Video Solution

16. The interval for which the function

$f(x) = x^2 - 6x + 3$, is strictly increasing is :



Watch Video Solution

17. The interval for which the function

$f(x) = x^2 - 8x + 7$, is strictly increasing is :



Watch Video Solution

18. The point on the curve $x^2 = 2y$ which is nearest to the point $(0, 5)$ is:



[Watch Video Solution](#)

Questions Carrying 1 Mark Type Iii

1. Show that the tangents to the curve $y = 7x^3 + 11$ at the points $x = 2$ and $x = -2$ are parallel.



[Watch Video Solution](#)

2. The slope of the tangent to the curve $y = 3x^2 + 4x$ at the point with x-coordinates -2 is -8.



[Watch Video Solution](#)

3. Prove that the function given by $f(x) = x^3 - 3x^2 + 3x - 100$ is increasing in \mathbb{R} .



[Watch Video Solution](#)

4. The function $f(x) = 7x - 3$ is a strictly increase function on \mathbb{R} .



[Watch Video Solution](#)

5. Maximum value of $f(x) = x^2, x \in \mathbb{R}$ is 4.



[Watch Video Solution](#)

6. Maximum value of the function $\sin x + \cos x$ is .



[Watch Video Solution](#)

7. The slope of tangent to the curve

$y = 2 - x^2$ at $x = 1$ is



[Watch Video Solution](#)

8. The function $f(x) = 2x + 3$ is a strictly

increasing function on \mathbb{R} .



[Watch Video Solution](#)

Questions Carrying 2 Marks

1. Find the equation of the tangent to the curve $y = (x^3 - 1)(x - 2)$ at points where the curve cuts the x-axis.



[Watch Video Solution](#)

2. Find the points on the curve $y = x^3 - 3x^2 + 2x$ at which tangent to the curve is parallel to the line $y - 2x + 3 = 0$.



[Watch Video Solution](#)

3. Find the equation of the tangent line to the curve $y = x^2 - 2x + 7$, which is parallel to the line $2x - y + 9 = 0$.



[Watch Video Solution](#)

4. Find the equation of the tangent line to the curve $y = x^2 - 2x + 7$ which is perpendicular to the line $5y - 15x = 13$



[Watch Video Solution](#)

5. Find the equation of the normals to the curve $y = x^3 + 2x + 6$ which are parallel to the line $x + 14y + 4 = 0$



[Watch Video Solution](#)

6. Find the point on the curve $y = 2x^3 - 15x^2 + 36x - 21$ at which the tangent is parallel to x-axis. Also, find the equation of tangents.



 [Watch Video Solution](#)

7. Find the equations of the tangents to the curve $3x^2 - y^2 = 8$, which pass through the point $\left(\frac{4}{3}, 0\right)$



[Watch Video Solution](#)

8. Find the equations of the normal at a point on the curve $x^2 = 4y$, which passes through the point (1,2). Also find the equation of the corresponding tangent.



Watch Video Solution

9. For the curve $y = 4x^3 - 2x^5$, find all the points at which the tangent passes through the origin.



Watch Video Solution

10. Find the value of p for which the curves $x^2 = 9p(9 - y)$ and $x^2 = p(y + 1)$ cut each other at right angles.



Watch Video Solution

11. Find the values of 'x' for which $f(x) = [x(x - 2)]^2$ is an increasing function. Also find the points on the curve, where the tangent is parallel to x-axis.



Watch Video Solution

12. Determine the values of x for which the function $f(x) = \frac{x}{x^2 + 1}$ is strictly increasing and for which it is strictly decreasing.



Watch Video Solution

13. Find the intervals in which the following functions are strictly increasing or strictly decreasing

$$x^3 - 6x^2 + 9x + 15$$



Watch Video Solution

14. Find the intervals in which the following functions are strictly increasing or strictly

decreasing :

$$f(x) = 2x^3 - 9x^2 + 12x + 30$$



[Watch Video Solution](#)

15. Find intervals in which the function given

by $f(x) = \frac{3}{10}x^4 - \frac{4}{5}x^3 - 3x^2 + \frac{36}{5}x + 11$

is

strictly decreasing



[Watch Video Solution](#)

16. Find intervals in which the function given

by $f(x) = \frac{3}{10}x^4 - \frac{4}{5}x^3 - 3x^2 + \frac{36}{5}x + 11$

is

strictly decreasing



Watch Video Solution

17. The lengths of the sides of an isosceles

triangle are $9 + x^2$, $9 + x^2$ and $18 - 2x^2$

units. Calculate the area of the triangle in

terms of x and find the value of x which makes the area maximum.



[Watch Video Solution](#)

18. Manufacturer can sell x items at a price of rupees $Rs\left(5 - \left(\frac{x}{100}\right)\right)$ each. The cost price of x items is $Rs\left(\left(\frac{x}{5}\right) + 500\right)$. Find the number of items he should sell to earn maximum profit.



[Watch Video Solution](#)

