



MATHS

BOOKS - ACCURATE PUBLICATION

APPLICATIONS OF DERIVATIVES



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

$$y=x^3$$
 at (1, 1), (-1, -1)

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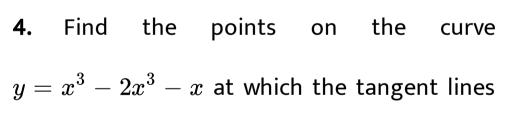
2. Find the equation of the tangent and normal to the given curves at the points given

$$y=x^3$$
 at (2, 8)

:

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.





are parallel to the line y = 3x - 2.

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

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

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

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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.

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

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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.

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.

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

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.

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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.

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

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.

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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.

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18. Find the equation of tangent to the curves

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

19. Find the equation of tangent to the curve $y = 3x^2 - 2x + 5$ which is parallel to the line 4x - y = 8. **Vatch 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

21. Find the equation of normal to the curve : $y = x^3 + x^2 - 11x + 15$, where normal is parallel to the line x - 3y + 1 = 0Watch Video Solution

22. Find the equation of normal to the curve $y = x^3 - 7x^2 - 20x + 1$ where normal is

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

23. Find the intervals in which the function f

given by
$$f(x) = 2x^3 - 3x + 5$$
 is

strictly increasing

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

strictly decreasing

25. Find the intervals in which the function :

$$f(x)=4-9x-2x^2$$
 is

strictly increasing



26. Find the intervals in which the function :

$$f(x)=4-9x-2x^2$$
 is

strictly decreasing



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.

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



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

strictly increasing



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

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

increasing

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



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

increasing

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



36. Find the intervals in which the function $f(x) = 30 - 24x + 15x^2 - 2x^3$ is strictly

decreasing.



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

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

decreasing,

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39. Find the intervals in which the function : $f(x) = 20 - 9x + 6x^2 - x^3$ is strictly increasing.



40. Find the intervals in which the function : $f(x) = 20 - 9x + 6x^2 - x^3$ is strictly

decreasing.

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

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

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

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

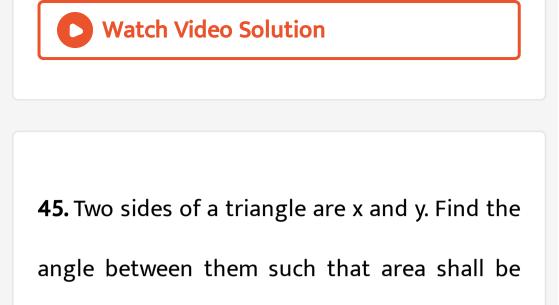


43. Find the intervals in which the following functions are strictly increasing or strictly decreasing :

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

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



maximum.



46. Show that of all rectangles with given

perimeter square has maximum area

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

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

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



Questions Carrying 1 Mark Type I

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

B. -2

C. 2

D. 3

Answer: B

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2. The slope of tangent to the curve $y = 3 - x^2$ at x = 1 is

B. -2

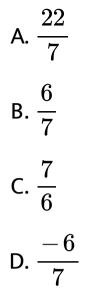
C. 2

D. 3

Answer: B

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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:



Answer: B

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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

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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

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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

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

$$2y+x^2=3$$
 is:

A.
$$x+y=0$$

$$\mathsf{B.}\,x-y=0$$

C.
$$x + y + 1 = 0$$

D.
$$x - y = 2$$

Answer: B

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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



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

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

increasing is

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

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

$\mathsf{C}.\left(2,\infty ight)$

D.(0,2)

Answer: D

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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. $(-2,\infty)$

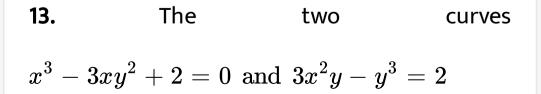
Answer: A

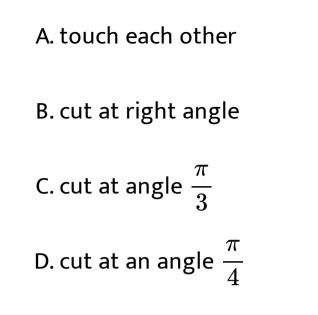
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12. The abscissa of the point on the curve $3y = 6x - 5x^3$, the normal at which passes through origin is

A. 1 B. $\frac{1}{3}$ C. 2 D. $\frac{1}{2}$

Answer: A





Answer: B



14. The tangent to the curve given by: $x = e^t \cos t, y = e^t \sin tatt = \frac{\pi}{4}$ makes with x-axis an angle A. 0

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

C. $\frac{\pi}{13}$
D. $\frac{\pi}{2}$



15. The equation of the normal to the curve y =

sin x at (0,0) is

B. y = 0 C. x + y = 0

A. x = 0

$$\mathsf{D}.\mathsf{x}-\mathsf{y}=\mathsf{0}$$

Answer: C

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

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17. The curve $y=x^{rac{1}{5}}$ 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

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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

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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

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20. The equation of tangent to the curve $yig(1+x^2ig)=2-x$, where it crosses x-axis is :

A.
$$x+5y=2$$

B.
$$x - 5y = 2$$

C.
$$5x - y = 2$$

D.
$$5x + y = 2$$

Answer: A

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

are :

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

$$\mathsf{B}.\,(2,\,34),\,(\,-2,\,0)$$

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

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

Answer: D

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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)

A (A 1)

D. (0, 2)

Answer: B

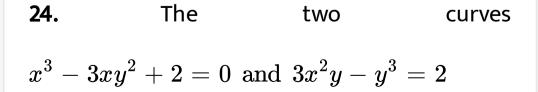
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23. The slope of the tangent to the curve $x = t^2 + 3t - 8, y = 2t^2 - 2t - 5$ at the point (2,-1) is:

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

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

Answer: B



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

B. $\frac{\pi}{3}$
C. $\frac{\pi}{2}$
D. $\frac{\pi}{6}$

Answer: C

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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

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26. Let $f \colon R \to R$ be defined by

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



- B. has a maximum at x = 0
- C. is a decreasing function
- D. is an increasing function

Answer: D

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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. $0 < x < rac{3}{2}$

Answer: A

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



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

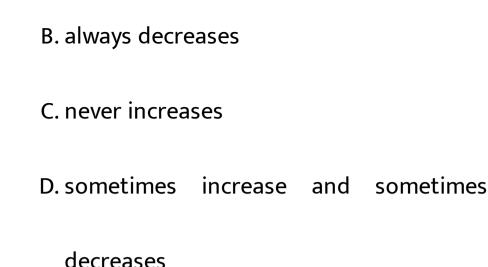
D. cos 3x

Answer: C

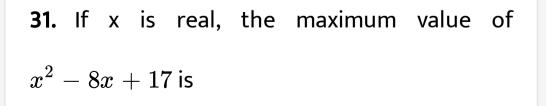
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30. The function f(x) = tanx - x

A. always increases



Answer: A



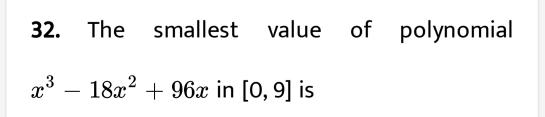
A. -1

B. 0

C. 1

D. 2

Answer: C



A. 128

B. 0

C. 135

D. 160

Answer: B

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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

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

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

C. $\sqrt{2}$

D. $2\sqrt{2}$

Answer: B

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

A. maximum

B. minimum

C. zero

D. neither maximum nor minimum

Answer: A



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



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

A. x = e
B.
$$x = rac{1}{e}$$

C. $x = 1$

D.
$$x=\sqrt{e}$$

Answer: B

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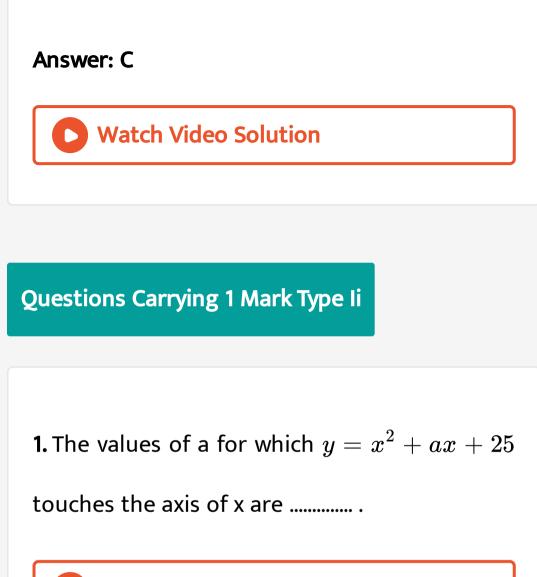
38. The maximum value of
$$\left(\frac{1}{x}\right)^x$$
 is :

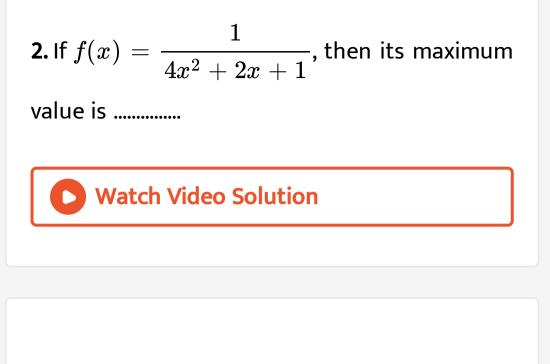
A. 1) e

 $\mathsf{B.}\, e^e$

$$\mathsf{C}.e^{rac{1}{e}}$$

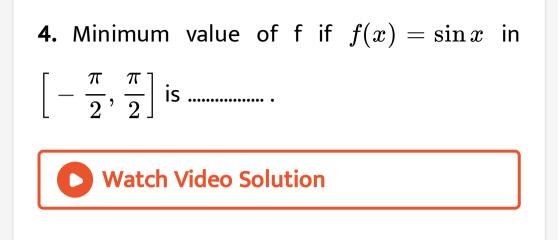
$$\mathsf{D.}\left(\frac{1}{e}\right)^{\frac{1}{e}}$$





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

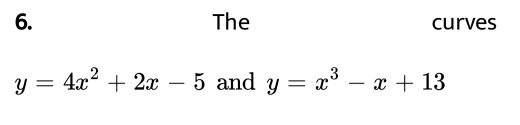
of



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

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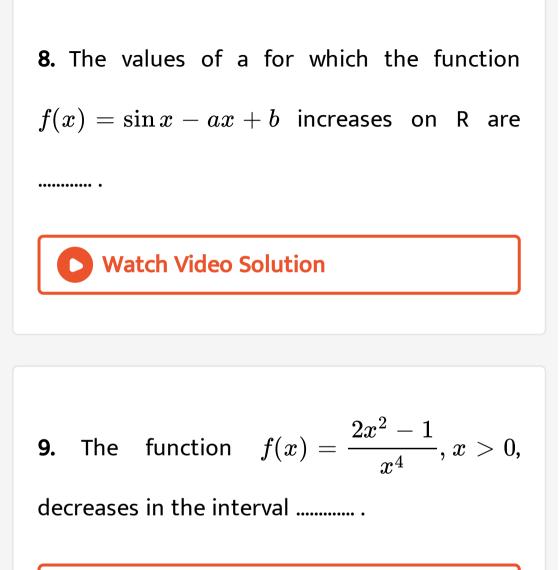


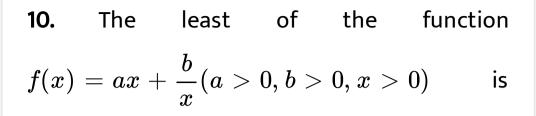
touch each other at the point



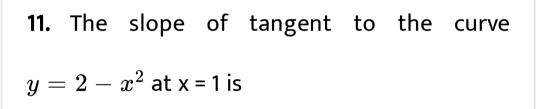
7. The equation of normal to the curve

y = an x at (0, 0) is









12. The line y = mx + 1, is a tangent to the

curve $y^2 = 4x$ if the value of m is:

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



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

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



16. The interval for which the function $f(x) = x^2 - 6x + 3$, is strictly increasing is :

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- 17. The interval for which the function
- $f(x)=x^2-8x+7$, is strictly increasing is :

18. The point on the curve $x^2 = 2y$ which is

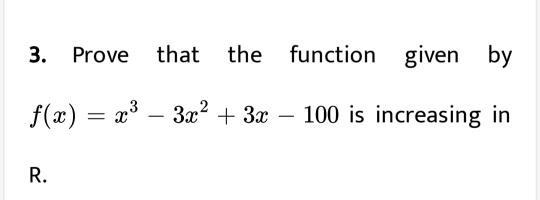
nearest to the point (0, 5) is:

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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.

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

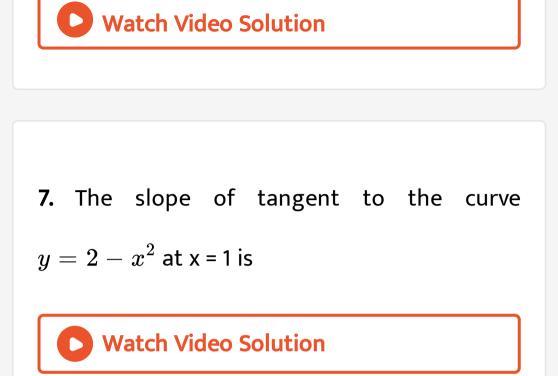


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4. The function f(x) = 7x - 3 is a strictly increase function on R. Watch Video Solution 5. Maximum value of $f(x) = x^2, x \in R$ is 4. Watch Video Solution

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

is .

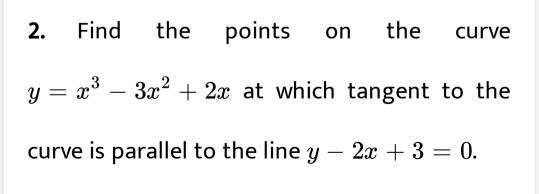


8. The function f(x) = 2x + 3 is a strictly

increasing function on R.



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.



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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.

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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

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

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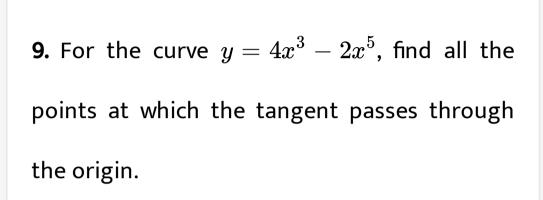
6. Find the point on the curve $y = 2x^3 - 15x^2 + 36x - 21$ at which the tangent is parallel to x-axis. Also, find the equation of tangents.



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

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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.



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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.



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



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.



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

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

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

decreasing :

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

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15. Find intervals in which the function given

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

strictly decreasing

16. Find intervals in which the function given
by
$$f(x) = rac{3}{10}x^4 - rac{4}{5}x^3 - 3x^2 + rac{36}{5}x + 11$$
 is

strictly decreasing

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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.

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.

