MATHS

BOOKS - OBJECTIVE RD SHARMA MATHS VOL I (HINGLISH)

MAXIMA AND MINIMA

Illustration

1. Let $f(x) = \left(1 + b^2\right)x^2 + 2bx + 1$ and let m(b) be the minimum value of f (x). As b varies, the range of m (b) is

A. [0,1]

B. (0, 1/2]

C. [1 /2 , 1]

D. [0, 1]

Answer: D

Watch Video Solution

2. if $f(x) = \int_0^x \left(t^2 + 2t + 2\right)$ dt where $x \in [2, 4]$ then

A. the minimum value of f(x) is $\frac{32}{3}$

B. the minimum value of f(x)Is 10

C. the maxium value of f(x) is 10

D. none of these

Answer: A

Watch Video Solution

3. The minimum value that

$f(x) = 4x^2 - 4x + 11 + \sin 3\pi x$ attains is

A. 12

B. 10

C. 8

D. none of these

Answer: D

Watch Video Solution

4. If m and M respectively denote the minimum and maximum of $f(x) = (x-1)^2 + 3$ for $x \in [-3, 1]$, then the ordered pair (m, M) is equal to

A. (-3,19)

B. (3,19)

C. (-19 , 3)

D. (-19 ,-3)

Answer: B

Watch Video Solution

5. If m and M are the minimum and the maximum values of $4+\frac{1}{2}\sin^2 2x-2\cos^4 x, x \in R$ then

A. $\frac{7}{4}$

B. $\frac{15}{4}$

C. $\frac{9}{4}$

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

Answer: C

Watch Video Solution

6. Let $f(x)=|x-x_1|+|x-x_2|$ where x_1 and x_2 are disinct real numbers of points at which f(x) is minimum is

A. More than 3

B. 1

C. 2

D. 3

Answer: A

Watch Video Solution

7. The number of points in the interval $\left[-\sqrt{13}\sqrt{13}\right]$ at which f(x) $= \sin x^2 + \cos x^2$ attains its maximum value is

A. 2

B. 8

C. 0

D. 4

Answer: D

Watch Video Solution

8. Let the tangent to the graph of $y = f(x)$ at the point $x = a$ be parallel to the x-axis and let $f'(a - h) > 0$ and $f(a + h) < 0$, where h is a very small positive number.Then, the ordinate of the points is

A. a maximum

B. a maximum

C. both a maximum and a mimum

D. neither a maximum nor a minimum

Answer: A

Watch Video Solution

9. The condition

$f(x) = x^3 + px^2 + qx + r(x \in R)$ to have no extreme value is

A. $p^2 < 3q$

B. $2p^2 < q$

C. $p^2 < \frac{q}{4}$

D. $p^2 > 3q$

Answer: A

Watch Video Solution

10. In the interval $[0, 1]$, the function $x^{25}(1-x)^{75}$ takes its maximum value at the point

A. 0

B. $1/4$

C. $1/2$

D. $1/3$

Answer: B

Watch Video Solution

11. The value of a so that the sum of the cubes of the roots of the equation $x^2ax + (2a - 3) = 0$ assumes the minimum vlaue's

A. a=1

B. a=3

C. a=0

D. non of these

Answer: B

Watch Video Solution

12. If $f(x) = 2x^3 - 21x^2 + 36x - 30$, then which one of the following is correct?

A. f(x) has minimum at x=1

B. f(x) has maximum at x=6

C. f(x) has maximum at x=1

D. f(x) has no maximum of minimum

Answer: C

Watch Video Solution

13. The maximum ordinate of a point on the graph of the function f(x) = sin x(1+ cos x) is

A. $\frac{2+\sqrt{3}}{4}$

B. $\frac{3\sqrt{3}}{4}$

C. 1

D. non of these

Answer: D

Watch Video Solution

14. The value of a so that the sum of the squares of the roots of the equations $x^2 - (a-2)x - a + 1 = 0$ assume the least value is

A. 2

B. 0

C. 3

D. 1

Answer: D

Watch Video Solution

15. The minimum distance of a point on the curve $y = x^2 - 4$ from origin

,

A. $\frac{\sqrt{5}}{2}$

B. $\frac{\sqrt{19}}{2}$

C. $\sqrt{\frac{15}{2}}$

D. $\sqrt{\frac{19}{2}}$

Answer: C

Watch Video Solution

16. Twenty meters of wire is available for fencing a flower -bed in the form of a circular sector .Then the maximum area in square meters of the flower bed is

A. 12.5

B. 10

C. 25

D. 30

Answer: C

Watch Video Solution

17. If $f(x) = \begin{vmatrix} \cos(2x) & \cos(2x) & \sin(2x) \\ -\cos x & \cos x & -\sin x \\ \sin x & \sin x & \cos x \end{vmatrix}$, then

A. f(x) =0 at exactly three points in $(-\pi, \pi)$

B. f(x) =0 at more than three points in $(-\pi, \pi)$

C. f(x) attains its minimum at x=0

D. f(x) attains its minimums at x=0

Answer: B::C

Watch Video Solution

18. The minmumu value of the fucntion

$f(x) = \frac{a^2}{x} + \frac{b^2}{a-x}, a > 0, b > 0$, in (0,a) is

A. a+b

B. $\frac{1}{a+b}$

C. $\frac{(a+b)^2}{a}$

D. $\frac{a+b}{a^2}$

Answer: C

Watch Video Solution

19. A wire of length 2 units is cut into two parts which are bent respectively to from a square ofside c units and a circle of radius r units if the sum of the sum of the areas of the square and the circle so fromed is minimum then

A. $2x = (\pi 4)r$

B. $(4-\pi)x = \pi r$

C. x=2r

D. 2x=r

Answer: C

Watch Video Solution

20. The minimum value of a $\tan^2 x + b\cot^2 x$ equals the maximum value of a $\sin^2\theta + b\cos^2\theta$ where $a > b > 0$

when

A. a=b

B. a=2b

C. a=3b

D. a=4b

Answer: D

Watch Video Solution

21. The number of critical points of $f(x) = \frac{|x-1|-1}{x^2}$ is

A. 1

B. 2

C. 3

D. none of these

Answer: C

Watch Video Solution

22. All possible value of $f(x) = (x+1)^{\frac{1}{3}} - (x-1)^{\frac{1}{3}}$ on [0,1] is 1 (b) 2 (c) 3 (d) $\frac{1}{3}$

A. 1

B. 2

C. 3

D. $1/3$

Answer: B

Watch Video Solution

23. The difference between the greatest between the greatest and least value of the function $f(x) = \sin 2x - x \quad \text{on}[-\pi/2, \pi/6]$, is

A. $\frac{\sqrt{3}+\sqrt{2}}{2}$

B. $\frac{\sqrt{3}+\sqrt{2}}{2} + \frac{\pi}{6}$

C. $\frac{\sqrt{3}}{2} + \frac{\pi}{2}$

D. $\frac{\sqrt{3}+\sqrt{2}}{2} - \frac{\pi}{3}$

Answer: C

Watch Video Solution

24. Let

$f(x) = \cos \pi x + 10x + 3x^2 + x^3, x \in [-2, 3]$

The absolute miniumum value of f(x) is

A. 0

B. -15

C. $3 - 2\pi$

D. none of these

Answer: B

Watch Video Solution

Section I Solved Mcqs

1. The value of a for which the function

$f(x) = a \sin x + \left(\frac{1}{3}\right) \sin 3x$ has an extremum at $x = \frac{\pi}{3}$ is

A. 1

B. -1

C. 0

D. 2

Answer: D

Watch Video Solution

2. If $f(x) = a\log|x| + bx^2 + x$

has its extremum values at $x = -1$ and $x = 2$ then

A. a=2 , b=-1

B. $a = 2, b = -1/2$

C. $a = -2, b = 1/2$

D. none of these

Answer: B

Watch Video Solution

3. The critical points of $f(x) = \frac{|2-x|}{x^2} is/are$

A. x=0,2

B. x=2,4

C. x=2,-4

D. none of these

Answer: D

Watch Video Solution

4. The set of all values of a for which the function $f(x) = (a^2 - 3a + 2)\left(\cos^2 \frac{x}{4} - \sin^2 \frac{x}{4}\right) + (a-1)x + \sin 1$ does not possess critical points is (A) $[1, \infty)$ (B) $(0, 1) \cup (1, 4)$ (C) $(-2, 4)$ (D) $(1, 3) \cup (3, 5)$

A. $[1, \infty]$

B. $(0, 1) \cup (1, 4)$

C. (-2,4)

D. $(1, 3) \cup (3, 5)$

Answer: B

Watch Video Solution

5. The value of a for which the function $f(x) = (4a-3)(x+\log 5) + 2(a-7)\frac{\cot x}{2}\frac{\sin^2 x}{2}$ does not possess critical points is $\left(-\infty, -\frac{4}{3}\right)$ (b) $(-\infty, -1)\ [1, \infty)$ (d) $(2, \infty)$

A. $(\infty, 4/3)$

B. $(\infty, 1)$

C. $(1, \infty)$

D. $(2, \infty)$

Answer: A::D

Watch Video Solution

6. For $a \in [\pi, 2\pi]$ and $n \in Z$ the critical points of g $f(x) = \frac{1}{3}\sin a \tan^3 x + (\sin a - 1)\tan x + \frac{\sqrt{a-2}}{8-a}$ are

A. $x = n\pi$

B. $x = 2n\pi$

C. $x = (2n+1)\pi$

D. none of these

Answer: D

Watch Video Solution

7. Suppose the cubic $x^3 - px + q$ has three real roots where $p > 0$ and $q > 0$. Then which one of the following holds ?

A. The cubic has minimum at both $\sqrt{\frac{p}{3}}$ and -$\sqrt{\frac{p}{3}}$

B. The cubic has maximum at both $\sqrt{\frac{p}{3}}$ and -$\sqrt{\frac{p}{3}}$

C. The cubic has minimum at $\sqrt{\frac{p}{3}}$ and maximum at $-\sqrt{\frac{p}{3}}$

D. The cubic has minimum at $-\sqrt{\frac{p}{3}}$ and maximum at $\sqrt{\frac{p}{3}}$

Answer: C

Watch Video Solution

8. The critical points of $f(x) = (x-2)^{\frac{2}{3}}(2x+1)$ are

A. 1 and 2

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

C. -1 and 2

D. 1

Answer: A

Watch Video Solution

9. If p and q are positive real numbers such that $p^2 + q^2 = 1$, then the maximum value of p+q is

A. $\frac{1}{\sqrt{2}}$

B. $\sqrt{2}$

C. 2

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

Answer: B

Watch Video Solution

10. Given P(x) $= x^4 + ax^3 + bx^2 + cx + d$ such that x=0 is the only real root of P'(x) =0 . If P(-1) lt P(1),$then \in the \int erval$[-1,1]`

A. P(-1) is the minimum and p(1)the maximum of P

B. (-1) is not minimum but p(1) the maximum of P

C. p(-1) is the minimum but P(1) is not the maximum of P

D. Niether p(-1) is the maxiumum nor P(1) is the maximum of P

Answer: B

Watch Video Solution

11. The difference between the greatest and least value of function $f(x) = \cos x + \frac{1}{2}\cos 2x - \frac{1}{3}\cos 3x$ is

A. $2/3$

B. $8/7$

C. $9/4$

D. $3/8$

Answer: C

Watch Video Solution

12. A straight line through the point (h, k) where $h > 0$ and $k > 0$, makes positive intercepts on the coordinate axes. Then the minimum length of line intercepted between the coordinate axes is

A. $\left(h^{2/3} + k^{2/3}\right)^{3/2}$

B. $\left(h^{3/2} + k^{3/2}\right)^{2/3}$

C. $\left(h^{2/3}-k^{2/3}\right)^{2/3}$

D. $\left(h^{3/2}-k^{3/2}\right)^{2/3}$

Answer: A

Watch Video Solution

13. e total number of local maxima and local minima of the function `f(x) = {(2+x)^3, -3

A. 0

B. 1

C. 2

D. 3

Answer: C

Watch Video Solution

14. If $f: R \in R$ is defined by

$f(x) = \dfrac{x^2 - ax + 1}{x^2 + ax + 1}, 0 < a < 2$, the which of the following is true:

A. f(x) is decreasing on (-1,1) and has local minimum at x=1

B. f(x) is increasing on (-1,1) and has local minimum at x=1

C. f(x) is increasing on(-1,1) and has neither a local maximum nor a local minimum at x=1

D. f(x) is crdeeasing on(-1,1) but has neither a local maximum nor a local minimum at x=1

Answer: A

Watch Video Solution

15. If $f(x) = \begin{cases} |x|, & \text{for} \quad 0 < |x| \leq 2 \\ 1, & f \text{ or} \quad x = 0 \end{cases}$. Then, at x = 0, f has

A. a local maximum

B. no local maximum

C. a local minimum

D. no extremum

Answer: A

Watch Video Solution

16. If $f(x)$ is a cubic polynomial which as local maximum at $x = -1$. If $f(2) = 18,\ f(1) = -1$ and $f'(x)$ has minimum at $x = 0$ then

A. the distance between $(-1, 2)$ and $(\alpha, f(\alpha))$ where $x = \alpha$ is the point of local minima is $2\sqrt{5}$

B. $f(x)$ is increasing for $x \in [1, 2\sqrt{5}]$ and has a local minima at $x = 1$

C. the value of $f(0)$ is 5

D. none of these

Answer: B

Watch Video Solution

17. If $f(x) = \begin{cases} e^x & ,0 \leq x < 1 \\ 2 - e^{x-1} & ,1 < x \leq 2 \\ x - e & ,2 < x \leq 3 \end{cases}$ and $g(x) = \int_0^x f(t)dt$, $x \in [1, 3]$, then

A. g(x) has a local maxima at $x = 1 + \log_e 2$ and local minima at x=e

B. f(x) has a local maxima at x=1 and local minima at x=2

C. f(x) and f(x) have same points of local maxima and local minima

D. none of these

Answer: C

Watch Video Solution

18. For the functions $f(x) = \int_0^x \frac{\sin t}{t} dt$ where $x > 0$. At $x = n\pi$ f(x) attains

A. maximum or minimum according as n is odd or even respectively .

B. minimum or maximum according as n is odd or even respectively

C. maximum at x= n π

D. minimum at x= n π

Answer: A

Watch Video Solution

19. Let

$$f(x) = \int_0^x (\sin t - \cos t)\left(e^t - 2\right)(t-1)^3(t-1)^3(t-2)^5 dt, 0 < x \leq 4$$

Then , the number of points where f(x) assumes local maximum value , is

A. 1

B. 2

C. 3

D. none of these

Answer: C

View Text Solution

20. Let f(x) be a function defined as

$$f(x) = \begin{cases} \sin\left(x^2 - 3x\right), & x \leq 0 \\ 6x + 5x^2, & x > 0 \end{cases}$$

Then at x=0,f(x)

A. has a local maxima

B. has a local minimum

C. is discontinuous

D. none of these

Answer: B

Watch Video Solution

21. Let f(x) be a function defined by

$$f(x) = \int_1^x t\left(t^2 - 3t + 2\right)dt, x \in [1, 3]$$

Then the range of f(x), is

A. [0,2]

B. $\left[-\frac{1}{4}, 4\right]$

C. $\left[-\frac{1}{4}, 2\right]$

D. none of these

Answer: C

Watch Video Solution

22. If the function $f(x) = \left(4\sin^2 x - 1\right)^n \left(x^2 - x + 1\right) n \in N$ has a local maximum at $x = \pi/6$ then n

A. can be any odd natural number

B. can only be an odd prime number d

C. can be any even natural number

D. can only be a multiple of 4.

Answer: C

Watch Video Solution

23. The set of critical pionts of the fuction f(x) given by

$$f(x) = x - \log_e x + \int_2^x \left(\frac{1}{t} - 2 - 2\cos 4t\right) dtis$$

A. $\left\{\frac{\pi}{6} + \frac{n\pi}{2} : n = 0, 1, 2. \ldots\right\}$

B. $\{n\pi : n \in N\}$

C. $\left\{n\pi + \frac{\pi}{6} : n \in N\right\} \cup \left\{\frac{\pi}{2}\right\}$

D. none of these

Answer: A

Watch Video Solution

24. If h(x)=f(x)+f(-x), " then " h(x) has got and extreme value at a point where f(x) is

A. and fucntion

B. an odd function

C. zero

D. none of these

Answer: A

Watch Video Solution

25. Let $f(x) = (x-2)^2 x^n, n \in N$ Then f(x) has a minimum at

A. $x = 2 \quad \text{for all} \quad n \in N$

B. x=2 ifn is odd

C. x=0 ifn is even

D. x=0 is if n is odd

Answer: A::C

Watch Video Solution

26. The difference between the greateset ahnd least vlaue of the function $f(x) = \int_0^x (6t^2 - 24) \text{ dt on } [1, 3] \text{ dt on } [1, 3]$ is

A. 14

B. 10

C. 5

D. 4

Answer: A

Watch Video Solution

27. Set of values of b for which local extrema of the function f(x) are positive where $f(x) = \frac{2}{3}a^2x^3 - \frac{5a}{2}x^2 + 3x + b$ and maximum occurs

at $x\frac{1}{3}$ is -

A. $(-4, \infty)$

B. $(-3/8, \infty)$

C. $(-10, 3/8)$

D. non of these

Answer: B

Watch Video Solution

28. if $f(x) = \left(\frac{\sin(x+\alpha)}{\sin(x+\beta)}\right), \alpha \neq \beta$ then f(x) has

A. maximum at x=0

B. minimum at x=0

C. neither maximum nor minimum

D. non of these

Answer: C

Watch Video Solution

29. if $f(x) = \left(\frac{\sin(x+\alpha)}{\sin(x+\beta), \alpha \neq \beta} \right.$ then f(x) has

A. maximum at x=0

B. minimum at x=0

C. neith maximum nor minimum

D. none of these

Answer: B

Watch Video Solution

30. let $f(x) = 1 + 2x^2 + 2^2x^4 + \ldots . + 2^{10}x^{20}$. The , $f(x)$ has

A. more than one minimum

B. exactly one minimum

C. at least one maximum none of these

D. neither a maximum nor a minimum

Answer: B

Watch Video Solution

31. The function $f(x) = \frac{x}{1 + x \tan x}$

A. one point of minimum in the interval $(0, \pi / 2)$

B. one point of maxmimum $(0, \pi / 2)$

C. no points of maximum , no point of minimum in the interval $(0, \pi / 2)$

D. two points of maxima in the interval $(0, \pi / 2)$

Answer: B

Watch Video Solution

32. A polynomial function f(x) is such that f''(4)= f''(4)=0 and f(x) has minimum value 10 at ax=4 .Then

A. $f''(x) = 4 + (x-4)^4$

B. $f(x) = 10 + (x-4)$

C. $f(x) - (x-4)^4$

D. non of these

Answer: B

Watch Video Solution

33. The number of vlaues of x where the function $f(x) = \cos x + \cos\left(\sqrt{2}x\right)$ attains its maximum is

A. 0

B. 1

C. 2

D. Infinite

Answer: B

Watch Video Solution

34. In the interval $(0, \pi/2)$ the fucntion $f(x) = \tan^n x + \cot^n x$ attains

A. the minimum value which is independent of n

B. a minimum vlaue which is a fuction of n

C. the minimum vlaue which is a function of 1

D. non of these

Answer: A

Watch Video Solution

35. The fraction exceeds its p^{th} power by the greatest number possible, where $p \geq 2$ is

A. $\left(\frac{1}{n}\right)^{\frac{1}{n-1}}$

B. $\left(\frac{1}{n}\right)^{n-1}$

C. $n^{\frac{1}{n}-1}$

D. non of these

Answer: A

Watch Video Solution

36. The greatest value of the fucntion $f(x) = \sin^{-1} x^2$ in interval $\left[-1/\sqrt{2}, 1/\sqrt{2}\right]$ is

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

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

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

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

Answer: D

Watch Video Solution

37. The minimum value of the fuction $f(x) = 2|x-2| + 5|x-3|$ for all $x \in R, is$

A. 3

B. 2

C. 5

D. 7

Answer: B

Watch Video Solution

38. The minimum value of the fuction f(x) given by $f(x) = \frac{x^m}{m} + \frac{x^{-n}}{n}$ where $\frac{1}{m} + \frac{1}{n} = 1$ and $m > 1$ is

A. 1

B. 0

C. 2

D. non of these

Answer: A

Watch Video Solution

39. The largest term of the sequence $< a_n >$ given by $a_n = \frac{n^2}{n^3 + 200}, n \in N$. Is

A. $\frac{49}{543}$

B. $\frac{8}{89}$

C. $\frac{1}{52}$

D. non of these

Answer: A

Watch Video Solution

40. Let $f(x) = ax^3 + bx^2 + cx + 1$ has exterma at $x = \alpha, \beta$ such that $\alpha\beta < 0 and f(\alpha)f(\beta) < 0$. Then the equation $f(x) = 0$ has three equal real roots one negative root if $f(\alpha)\langle 0 and f(\beta)\rangle 0$ one positive root if $f(\alpha)\langle 0 and f(\beta)\rangle 0$ none of these

A. three distinct real roots

B. one positive root if $f(\alpha) < 0$ and $f(\beta) > 0$

C. on negative root if $f(\alpha) > 0$ and $(\beta) < 0$

D. all the above

Answer: D

Watch Video Solution

41. $P = x^3 - \frac{1}{x^3}, Q = x - \frac{1}{x}$ $x \in (1, \infty)$ then minimum value of $\frac{P}{\sqrt{3}Q^2}$

A. $2\sqrt{2}$

B. $-2\sqrt{3}$

C. non-existent

D. non of these

Answer: A

Watch Video Solution

42. Let $f(x) = \cos 2\pi x + x - [x]([\cdot]$ denotes the greatest integer function). Then number of points in $[0, 10]$ at which f(x) assumes its local maximum value, is

A. 0

B. 10

C. 9

D. Infinite

Answer: B

Watch Video Solution

43. Let $f(x) = a - (x - 3)^{8/9}$ then greatest value of f(x) is

A. 3

B. a

C. no maximum vlaue

D. non of these

Answer: B

Watch Video Solution

44. A function f such that $f'(a) = f''(a) = \ldots. = f^{2n}(a) = 0$,

and f has a local maximum value b at x=a ,if f (x) is

A. $(x-a)^{2n-2} + b$

B. $b - 1 - (x+a)^{2n+1}$

C. $b - (x-a)^{2n+a}$

D. $(x-a)^{2n+2} + b$

Answer: C

View Text Solution

45. Let $f(x) = \begin{cases} 3x^2 - 2x + 10 & x < 1 \\ -2 & x > 1 \end{cases}$

The set of values of b for which f(x) has greatest value at x=1 is

A. $(-6, -2)$

B. (2,6)

C. $(-6, -2) \cup (2, 6)$

D. $(-6, 6)$

Answer: C

View Text Solution

46. The maximum value of $\cos\left(\int_{2x}^{x^2} e^t \sin^2 \quad t \, dt\right)$

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

B. 0

C. 1

D. non -existent

Answer: C

Watch Video Solution

47. Let $f(x) = \begin{cases} 1 + \sin x & x < 0 \\ x^2 - x + 1 & x \geq 0 \end{cases}$

A. f has a local maximum at x=0

B. f has a local minimum at x=0

C. f is increasing in (0, 1/2)

D. f is decreasing in (0,1/2)

Answer: B

Watch Video Solution

48. Let f(x) $= x^{n+1} + ax^n$, where $a > 0$. Then, x=0 is point of

A. local minimum for any integer n

B. local minimum if n is an even integer

C. local maximum if n is an even integer

D. local minimum if n is am odd interger

Answer: C

Watch Video Solution

49. The greph of $y = x^3 + ax^2 + bx + c$ has no extemun if and only if

A. $a^2 = b$

B. $a^2 < 3b$

C. $a^2 > 2b$

D. $a^2 > 2b^2$

Answer: B

Watch Video Solution

50. If f(x) $= \int_x^{x^2} (t-1)dt, 1 \leq x \leq 2$ then the greatest value of ϕ (x) , is

A. 2

B. 4

C. 8

D. none of these

Answer: B

Watch Video Solution

51. If the parabola $y = ax^2 + bx + c$ has vertex at(4,2)and $a \in [1, 3]$ then the difference beteween the extreme value of abc is equal to

A. 3600

B. 144

C. 3456

D. none of these

Answer: C

Watch Video Solution

52. Let f(X)=In $\left(2x - x^2\right) + \frac{\sin(\pi x)}{2}$. Then which one of the following options is not correct ?

View Text Solution

53. If α and β respectively the minmum and minimum values of the fuction f(x) given by

$$f(x) = \begin{vmatrix} 1+\sin^2 & x\cos^2 x & \sin 2x \\ \sin^2 x & 1+\cos^2 x & \sin 2x \\ \sin^2 x & \cos^2 x & 1+\sin 2x \end{vmatrix}$$ then which one of the following options is not true ?

A. $\alpha + \beta^9 = 4$

B. $\alpha^3 - \beta^7 = 26$

C. $\alpha^{2n} - \beta^{2n}$ is always and even integer for $n \in N$

D. a triangle can be costructed having its sides as α, β and $\alpha - \beta$

Answer: D

Watch Video Solution

54. Let $f(x) = \begin{cases} x^2 + 4x, -3 \leq x \leq 0 \\ -\sin x, 0 < x \leq \pi/2 \\ -\cos x - 1, \pi/2 < x \leq \pi \end{cases}$

which one of the following is not true ?

A. x=-2 is the point of global minimum

B. x=π is the point of global maximum

C. f(x) is not differentiable at $x = \frac{\pi}{2}$

D. f(x) is discontinunous at x=0

Answer: A,D

Watch Video Solution

55. If α be the number of solutions of the equation [sin x] =|x|) and β be the greatest value of the function

$f(x) = \cos\left(x^2 - \left[x^2\right)\right)$ in the interval][-1,1] the

A. $\alpha = \beta$

B. $\alpha > \beta$

C. $\alpha < \beta$

D. non of these

Answer: A

Watch Video Solution

56. Let

$f(x_1, x_2, x_3, x_4) = x_1^2 + x_2^2 + x_3^2 + x_4^2 - 2(x_1 + x_2 + x_3 + x_4) + 10$

and $x_1, x_3 \in [-1, 2]$ and $x_2, x_4 \in [1, 4]$ then the maximum value of f is

A. 24

B. 20

C. 32

D. none of these

Answer: C

Watch Video Solution

57. Let f, g and h be real-valued functions defined on the interval $[0, 1]$ by $f(x) = e^{x^2} + e^{-x^2}$, $g(x) = xe^{x^2} + e^{-x^2}$ and $h(x) = x^2e^{x^2} + e^{-x^2}$. if a, b and c denote respectively, the absolute maximum of f, g and h on $[0, 1]$ then

A. $a = b$ and $c \neq b$

B. $a = c$ and $a \neq b$

C. $a \neq b$ and $c \neq b$

D. a=b=c

Answer: D

Watch Video Solution

58. Let f be a function defined on R (the set of all real numbers) such that $f'(x) = 2010(x-2009)(x-2010)^2(x-2011)^3(x-2012)^4$, for all $x \in R$. If g is a function defined on R with values in the interval $(0, \infty)$ such that $f(x) = \ln(g(x))$, for all $x \in R$, then the number of point is R at which g has a local maximum is ___

A. 1

B. 2

C. 3

D. 4

Answer: A

Watch Video Solution

59. Let $f: R \to R$ be defined by

$$f(x) = \begin{cases} 2k - 2x, & \text{if } x \leq -1 \\ 2x + 3, & \Leftrightarrow x > -1 \end{cases}$$

If f has a local minimum at x=-1, then a possible value of k is

A. $-1/2$

B. -1

C. 1

D. 0

Answer: B

Watch Video Solution

60. For $e \in \left(0, \frac{5\pi}{2}\right)$ define $f(x) = \int_0^x \sqrt{t} \sin t dt$ has local maximum at π and 2π

A. local maximum at π and 2π

B. local manimum at π and 2π

C. local minimum at π and maximum at2π

D. local maximum at π and minimum at 2π

Answer: D

Watch Video Solution

61. Let $p(x)$ be a real polynomial of least degree which has a local maximum at $x = 1$ and a local minimum at $x = 3$. If $p(1) = 6 and p(3) = 2,$ then $p'(0)$ is____

A. 8

B. 9

C. 3

D. 6

Answer: B

Watch Video Solution

62. Let $IR\overrightarrow{I}R$ be defined as $f(x) = |x| + + x^2 - 1|$. The total number of points at which f attains either a local maximum or a local minimum is_____

A. 2

B. 4

C. 5

D. 6

Answer: C

Watch Video Solution

63. If $f(x) = \int_0^x e^{t^2}(t-2)(t-3)dt \quad \text{for all} \quad x \in (0, \infty)$

then which of the following is incorrect ?

A. f has a local maximum at x=2 and local minimum at x=3

B. f is dereasing on (2,3)

C. there exists $c \in (0, \infty) \quad \text{such that f} \quad (c) = 0$

D. f is inceresing on R^+

Answer: D

Watch Video Solution

64. The function $f(x) = 2|x| + |x+2| = ||x|2| - 2|x||$ has a local minimum or a local maximum at $x = -2$ (b) $-\frac{2}{3}$ (c) 2 (d) $\frac{2}{3}$

A. -2 and $-\frac{2}{3}$

B. (b)-2 and 0`

C. $-\frac{2}{3}$ and 2

D. 2 and -2

Answer: A

Watch Video Solution

65. Let f:[0,1] $\rightarrow$ R be a function . Suppose the fuction f is twice differentiable with f(0) =f(1)=0 and satisfies

$f(x) - 2f(x) + f(x) \geq e^x$ for all $x \in [0, 1]$.Which of the following is true for x $\in (0, 1]$?

A. $0 < f(x) < \infty$

B. $-\frac{1}{2} < f(x) < \frac{1}{2}$

C. $-\frac{1}{4} < f(x) < 1$

D. $-\infty < f(x) < 0$

Answer: D

View Text Solution

66. Let f:[0,1] $\rightarrow$ R be a function.such that $f(0) = f(1) = 0$ and $f''(x) + f(x) \geq e^x$ for all $x \in [0, 1]$.If the fucntion $f(x)e^{-x}$ assumes its minimum in the interval [0,1] at $x = \frac{1}{4}$ which of the following is true ?

A. $f(x) < 0 f(x)$ for $\frac{1}{4} < x < \frac{3}{4}$

B. $f(x) \geq f(x) f$ or $0 < x < \frac{1}{4}$

C. $f(x) < f(x)$ for $0 < x < \frac{1}{4}$

D. $f(x) f$ or $\frac{3}{4} < x <$

Answer: C

View Text Solution

67. A rectangular sheet of fixed perimeter with sides having their lengths in the ratio $8:15$ is converted into anopen rectangular box by folding after removing squares of equal area from all four corners. If the total area of removed squares is 100, the resulting box has maximum volume. Then the length of the sides of the rectangular sheet are

A. 24,45

B. 32,65

C. 24,60

D. 32,60

Answer: A

Watch Video Solution

68. Let f(x) be a polynomial of degree four having extreme vlaues at x=1 and x =2 .If $\lim_{x \to 0} \left(1 + \frac{f(x)}{x^2}\right) = 3$ then f(2) is equal to

A. 0

B. 4

C. -8

D. -4

Answer: A

Watch Video Solution

69. A cylindrica container is to be made from certain solid material with the following constraints: It has a fixed inner volume of Vm^3, has a 2 mm thick solid wall and is open at the top. The bottom of the container is a solid circular disc of thickness 2mm and is of radius equal to the outer radius of the container. If the volume the material used to make the

container is minimum when the inner radius of the container is $10mm$. then the value of $\frac{V}{250\pi}$ is

A. 6

B. 8

C. 7

D. 4

Answer: D

Watch Video Solution

70. The minimum value of the function

$f(x) = x^{3/2} + x^{-3/2} - 4\left(x + \frac{1}{x}\right)$ for all permissible real x is

A. -10

B. -6

C. -7

D. -8

Answer: A

Watch Video Solution

71. The least value of $a \in \mathbb{R}$ for which $4ax^2 + \frac{1}{x} \geq 1$, for all $x > 0$, is

A. $\frac{1}{64}$

B. $\frac{1}{32}$

C. $\frac{1}{27}$

D. $\frac{1}{25}$

Answer: C

Watch Video Solution

72. The abscissae of a point, tangent at which to the curve $y = e^x \sin x, x \in [0, \pi]$ has maximum slope is

A. 0

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

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

D. π

Answer: C

Watch Video Solution

Section Ii Assertion Reason Type

1. Statement -1 The maximum value of $f(x) = \frac{1}{3x^4 + 8x^3 - 18x^2 + 60}$ is $\frac{1}{53}$

Statement -2 : The function g(x) = $\frac{1}{f(x)}$ attains its minimum value at x=1 and x=-3

A. Statement-1 is True, Statement-2 is True,Statement -2 is a correct explanation for Statement -1

B. Statement -1 True ,Statement -2 is True ,Stament -2 is not a correct explanation for Statement -!

C. Statement -1 is True Statement -2 is False

D. Statement -1 is Flase,Statement -2 is True

Answer: A

Watch Video Solution

2. $f(x) = \begin{cases} e^x + 1, & -1 \leq x > 0 \\ e^x, & x = 0 \\ e^x - 1, & 0 < x \leq 1 \end{cases}$

Statement -1 is bounded but never attains its macimum and minimum values

Statement-2 x=0 is the point of discontinuity of f(x)

A. Statement-1 is True, Statement-2 is True,Statement -2 is a correct explanation for Statement -2

B. Statement -1 True ,Statement -2 is True ,Stament -2 is not a correct explanation for Statement -!

C. Statement -1 is True Statement -2 is False

D. Statement -1 is Flase,Statement -2 is True

Answer: A

Watch Video Solution

3. Statement-1 . The critical points of f(x)=xcosx occur in $(\pi/4, \pi/3)$

Statement-2 : The functions g(x)=xtanx increase ion $(0, \pi/2)$

A. Statement-1 is True, Statement-2 is True,Statement -2 is a correct explanation for Statement -3

B. Statement -1 True ,Statement -2 is True ,Stament -2 is not a correct explanation for Statement -!

C. Statement -1 is True Statement -2 is False

D. Statement -1 is Flase,Statement -2 is True

Answer: B

Watch Video Solution

4. Let f(x)=2sinx+tax-3x

Statement-1: f(x) does not attain extreme in $(-\pi/2, \pi/2)$

Statement-2 : f(x) is strictly increasing on $(-\pi/2, \pi/2)$

A. Statement-1 is True, Statement-2 is True,Statement -2 is a correct explanation for Statement -4

B. Statement -1 True ,Statement -2 is True ,Stament -2 is not a correct explanation for Statement -!

C. Statement -1 is True Statement -2 is False

D. Statement -1 is Flase,Statement -2 is True

Answer: A

Watch Video Solution

5. Let $\tan^{-1}\frac{1-x}{1+x}$Stament-1: The difference of the greatest and smaallest values of $f(x)$ on $[0,1] is f(0)-f(1)=\pi/4$

Statement-2 : $g(x)=\tan^{-1}x$ is an increasing functions on $[0,\infty]$

A. Statement-1 is True, Statement-2 is True,Statement -2 is a correct explanation for Statement -5

B. Statement -1 True ,Statement -2 is True ,Stament -2 is not a correct explanation for Statement -!

C. Statement -1 is True Statement -2 is False

D. Statement -1 is Flase,Statement -2 is True

Answer: A

Watch Video Solution

6. Let f: R R be a continuous function defined by $f(x) = \frac{1}{e^x + 2e^{-x}}$. Statement-1: $f(c) = \frac{1}{3}$, for some $c \in R$. Statement-2: $0 < f(x) \leq \frac{1}{2\sqrt{2}}$, for all $x \in R$. (1) Statement-1 is true, Statement-2 is true; Statement-2 is not the correct explanation for Statement-1 (2) Statement-1 is true, Statement-2 is false (3) Statement-1 is false, Statement-2 is true (4) Statement-1 is true, Statement-2 is true; Statement-2 is the correct explanation for Statement-1

A. Statement-1 is True, Statement-2 is True,Statement -2 is a correct explanation for Statement -6

B. Statement -1 True ,Statement -2 is True ,Stament -2 is not a correct explanation for Statement -!

C. Statement -1 is True Statement -2 is False

D. Statement -1 is Flase,Statement -2 is True

Answer: A

Watch Video Solution

7. Let be a function defined by $f(x) = \begin{cases} \frac{\tan x}{x}, & x \neq 0 \\ 1, & x = 0 \end{cases}$

Statement-1: x=0 is a point on minima of f

Statement-2: f'(0)=0

A. Statement-1 is True, Statement-2 is True,Statement -2 is a correct explanation for Statement -7

B. Statement -1 True ,Statement -2 is True ,Stament -2 is not a correct explanation for Statement -!

C. Statement -1 is True Statement -2 is False

D. Statement -1 is Flase,Statement -2 is True

Answer: B

Watch Video Solution

Exercise

1. For the curve $y = xe^x$, the point

A. x=-1 is a point of minimum

B. x=0 is a point of minimum

C. x=-1 is a point of maximum

D. x=0 is a point of maximum

Answer: A

Watch Video Solution

2. The gratest value of the function $f(x) = \frac{\sin x}{\sin\left(x + \frac{\pi}{4}\right)}$ on thhe interval $[0, \pi/2]$ is

A. $1/\sqrt{2}$

B. $\sqrt{2}$

C. 1

D. $-\sqrt{2}$

Answer: B

Watch Video Solution

3. If $P(x) = a_0 + a_1x^2 + a_2x^4 + \ldots + a_nx^{2n}$ is a polynomial in a real variable x with $0 < a_0 < a_1 < a_2 < \ldots < a_n$. Then, the function $P(x)$ has

A. niether a maximum nor a minimum

B. only one maximum

C. only one minimum

D. none of these

Answer: C

Watch Video Solution

4. A differentiable function $f(x)$ has a relative minimum at $x = 0$. Then the function $f = f(x) + ax + b$ has a relative minimum at $x = 0$ for all a and all$b$ (b) all b if $a = 0$ all $b > 0$ (d) all $a > 0$

A. all a and all b

B. all b if a=0

C. all b gt 0

D. all a gt 0

Answer: B

Watch Video Solution

5. The function $\int_1^x \left\{2(t-1)(t-2)^3 + 3(t-1)^2(t-2)^2\right\}$ attains its maximum at x=

A. 1

B. 2

C. 3

D. 4

Answer: A

Watch Video Solution

6. If the function $f(x) = x^3 + 3(1-7)x^2 + 3\left(a^2-9\right)x - 1$ has a positive point Maximum , then

A. $a \in (3, \infty) \cup (-\infty, -3)$

B. $a \in (-\infty, -3) \cup (3, 29/7)$

C. $(-\infty, 7)$

D. $(-\infty, 29)$

Answer: B

Watch Video Solution

7. Show that the maximum value of $\left(\frac{1}{x}\right)^x$ is $e^{\frac{1}{e}}$.

A. e

B. e^e

C. $e^{1/e}$

D. $(1/e)^{1/e}$

Answer: C

Watch Video Solution

8. If the function $f(x) = 2x^3 - 9ax^2 + 12a^2x + 1$ attains its maximum and minimum at p and q respectively such that $p^2 = q$, then a equals

A. 0

B. 1

C. 2

D. none of these

Answer: C

Watch Video Solution

9. The maximum distance of the point $(k, 0)$ from the curve $2x^2 + y^2 - 2x = 0$ is equal to

A. $\sqrt{1 - 2a + a^2}$

B. $\sqrt{1 + 2a + 2a^2}$

C. $\sqrt{1 + 2a - a^2}$

D. $\sqrt{1 - 2a + 2a^2}$

Answer: D

Watch Video Solution

10. A cubic f(x) vanishes at x=-2 and has relative minimum "/" maximum at x=-1 and $x = \frac{1}{3}$ such that $\int_{-1}^{1} f(x)dx = \frac{14}{3}$. Then , f(x) is

A. $x^3 + x^2 - x$

B. $x^3 + x^2 - x + 1$

C. $x^3 + x^2 - x + 2$

D. $x^3 + x^2 - x - 2$

Answer: C

Watch Video Solution

11. An isosceles triangle of vertical angle 2θ is inscribed in a circle of radius a . Show that the area of the triangle is maximum when $\theta = \frac{\pi}{6}$.

A. $\pi/6$

B. $\pi/4$

C. $\pi/3$

D. $\pi / 2$

Answer: A

Watch Video Solution

12. Find minimum value of $px + qy$ where $p > 0, q > 0, x > 0, y > 0$ when $xy = r,^2$ without using derivatives.

A. $2r\sqrt{pq}$

B. $2pq\sqrt{r}$

C. $-2r\sqrt{pq}$

D. none of these

Answer: A

Watch Video Solution

13. The maximum slope of the curve $y = -x^3 + 3x^2 + 9x - 27$ is

A. 0

B. 12

C. 16

D. 32

Answer: B

Watch Video Solution

14. If $\frac{x+c}{1+x^2}$ where c is a constant , then when y is stationary , xy is equal to

A. $1/2$

B. $3/4$

C. $5/8$

D. 1

Answer: A

Watch Video Solution

15. N Characters of information are held on magnetic tape, in batches of x characters each, the batch processing time is $\alpha + \beta x^2$seconds, α and β are constants. The optical value of x for fast processing is

A. α / β

B. β / α

C. $\sqrt{\alpha / \beta}$

D. $\sqrt{\beta / \alpha}$

Answer: C

Watch Video Solution

16. if $A > 0, B > 0$ and $A + B = \frac{\pi}{3} then the \max i\mu m value of \tan A.\tan B is($

1/3(B)1/6(C)1/2` (D) 1

A. $1/\sqrt{3}$

B. $1/3$

C. 3

D. $\sqrt{3}$

Answer: B

Watch Video Solution

17. The largest value of $2x^3 - 3x^2 - 12x + 5$ for $-2 \leq x \leq x2$ occurs when

A. -2

B. -1

C. 2

D. 4

Answer: D

Watch Video Solution

18. The first and second order derivatives of a function f(x) exit at all point in (a,b) with f'(c) =0 , where $a < c < b$, of c and $f'(x) > 0$ for all points on the immediate right of c, and $f'(x) < 0$ for all points on the immediate left of c then at x=c , , f(x) has a

A. local maximum

B. local minimum

C. point of inflexion

D. none of these

Answer: B

Watch Video Solution

19. The minimum value of 2^{x^2-3} ^ $(3+27)$ is 2^{27} (b) 2 (c) 1 (d) none of these

A. 2^{27}

B. 2

C. 1

D. 4

Answer: C

Watch Video Solution

20. Let f(x) =cosx sin2x. Then , min $(f(x): -\pi \leq x \leq \pi)$ is

A. $-9/7$

B. $9/7$

C. $-1/9$

D. $-2/9$

Answer: A

Watch Video Solution

21. If $f(x) = \sin^6 x + \cos^6 x$, then which one of the following is false

A. $f(x) \leq 1$

B. $f(x) \leq 2$

C. $f(x) > \frac{1}{4}$

D. $f(x) \leq \frac{1}{8}$

Answer: D

Watch Video Solution

22. The function $f(x) = a\sin x + \frac{1}{3}$ sin3x has maximum value at $x = \pi/3$. The value of a , is

A. 3

B. $1/3$

C. 2

D. $1/2$

Answer: C

Watch Video Solution

23. If $ax + \frac{b}{x} \geq c$ for all positive x, where $a, b, c > 0,$ then-

A. $ab \geq \frac{c^2}{4}$

B. $ab < \frac{c^2}{4}$

C. `bcgea^2/41

D. $ac \geq \frac{b^2}{4}$

Answer: A

Watch Video Solution

24. The greatest value of $f(x) = \cos\left(xe^{[x]} + 7x^2 - 3x\right), x \in [-1, \infty]$, is (where [.] represents the greatest integer function). -1 (b) 1 (c) 0 (d) none of these

A. -1

B. 1

C. 0

D. cos1

Answer: B

Watch Video Solution

25. The points of extremum of the function

$\phi(x) = \int_1^x e^{-t^2/2}(1-t^2)dt$, are

A. x=0,1

B. x=1,-1

C. x=$1/2$

D. $x = -1/2$

Answer: B

Watch Video Solution

26. Let $f(x) = \int_0^x \frac{\cos t}{t} dt$ Then at $x = (2n+1)\frac{\pi}{2}$ f(x) has

A. maxima when n=-2,-4,-6,.. and minima when n=-1,3,-5,..

B. minima when n=-1,-3,-5,... and minima when n=1,3,5,...

C. minima when n=0,2,4,... and maxima when n=1,3,5,...

D. none of these

Answer: B

Watch Video Solution

27. It is given that at $x = 1$, the function $x^4 - 62x^2 + ax + 9$ attains its maximum value on the interval $[0, 2]$. Find the value of a.

A. 120

B. -120

C. 52

D. 60

Answer: A

Watch Video Solution

28. The minimum value of $\left(1+\frac{1}{\sin^n \alpha}\right)\left(1+\frac{1}{\cos^n \alpha}\right)$ is

A. 1

B. 2

C. $\left(1+2^{n/2}\right)^2$

D. 4

Answer: C

Watch Video Solution

29. The minimum value of (x-a)(x-b) is

A. ab

B. $\frac{(a-b)^2}{4}$

C. 0

D. $\frac{-(a-b)^2}{4}$

Answer: D

Watch Video Solution

30. The attitude of a right circular cone of minimum volume circumscired about a sphere of radius r is

A. 2r

B. 3r

C. 5r

D. $\frac{3}{2}r$

Answer: D

View Text Solution

31. If $(x-a)^{2m}(x-b)^{2n+1}$, where m and n are positive integers and $a > b$, is the derivative of a function f then-

A. x=a is a point of minimum

B. x=b is a point of maximum

C. x=a is not a point of maximum or minimum

D. none of these

Answer: C

Watch Video Solution

32. If $(x-a)^{2m}(x-b)^{2n+1}$, where m and n are positive integers and $a > b$, is the derivative of a function f then-

A. x=b is point of minimum

B. x=b is a point of maximum

C. x=b is a point of inflextion

D. none of these

Answer: A

Watch Video Solution

33. The maximum and minimum values of $y = \frac{ax^2 + 2bx + c}{Ax^2 + 2Bx + C}$ are these for which :

A. $ax^2 + 2bx + c - y\left(Ax^2 + 2Bx + C\right)$ is equal to zero

B. $ax^2 + 2bx + c - y\left(Ax^2 + 2Bx + C\right)$ is a perfect square

C. $\frac{dy}{dx} = 0$ and $\frac{d^2y}{dx^2} = 0$

D. $ax^2 + 2bx + c - y\left(Ax^2 + 2Bx + C\right)$ is not a perfect square

Answer: B

Watch Video Solution

34. In a $ABC, \angle B = 90^0 and b + a = 4.$ The area of the triangle is maximum when $\angle C$ is $\frac{\pi}{4}$ (b) $\frac{\pi}{6}$ $\frac{\pi}{3}$ (d) none of these

A. $\pi/4$

B. $\pi/6$

C. $\pi/3$

D. none of these

Answer: C

Watch Video Solution

35. The function f(x) given by

$$f(x) = \begin{vmatrix} x-1, & x+1, & 2x+1 \\ x+1, & x+3, & 2x+3 \\ 2x+1, & 2x-1, & 4x+1 \end{vmatrix}$$ has

A. one point of maximum and one point of minimum

B. one point of maximum only

C. one point of maximum only

D. none of these

Answer: D

Watch Video Solution

36. Maximum area of a reactangle which can be inscribed in a circle of a given radius R is

A. πr^2

B. r^2

C. $\pi r^2 / 4$

D. $2r^2$

Answer: D

Watch Video Solution

37. $f(x) = \begin{cases} 3x^2 + 12x - 1 & -1 \leq x \leq 2 \\ 37 - x, & 2 < x \leq 3 \end{cases}$

Which of the following statements is /are correct?

1. f(x) is increasing in the interval [-1,2].

2. f(x) is decreasing in the interval (2,3].

Select the correct answer using the code given below:

A. f(x) is increasing in [-1,2]

B. f(x) is continuous in [-1,3]

C. f(x) is maximum at x=2

D. all of the above

Answer: D

Watch Video Solution

38. The perimeter of a sector is p. The area of the sector is maximum when its radius is

A. $p/2$

B. $1/\sqrt{p}$

C. $\sqrt{p}$

D. $p/4$

Answer: D

Watch Video Solution

39. If $a^2x^4 + b^2y^4 = c^6$, then maximum value of xy is

A. $\frac{c^3}{2ab}$

B. $\frac{c^3}{\sqrt{2ab}}$

C. $\frac{c^3}{ab}$

D. $\frac{c^3}{\sqrt{ab}}$

Answer: B

Watch Video Solution

40. The function $\int_{-1}^{1} t(e^t - 1)(t-1)(t-2)^3(t-3)^t dt$ has local minimum at x=

A. 0

B. 1

C. 2

D. 3

Answer: D

Watch Video Solution

41. Let f(x) be a function such that $f'(a) \neq 0$. Then , at x=a, f(x)

A. cannot have a maximum

B. cannot have a minimum

C. must have niether a maximum nor a minimum

D. none of these

Answer: C

Watch Video Solution

42. Let a,b,c be positive real parameter and $ax^3 + \frac{b}{x^2} \geq c, \forall x \epsilon R$ then (A) $4ab \geq c^2$ (B) $4c \geq b^2$ (C) $4bc \geq c^2$ (D) $4ac < b^2$

A. $4ab \geq c^2$

B. $4ac \geq b^2$

C. $4bc \geq a^2$

D. $4ac < b^2$

Answer: A

Watch Video Solution

43. If $xy = a^2$ and $S = b^2x + c^2y$ where a, b and c are constants then the minimum value of S is

A. abc

B. $\sqrt{a}bc$

C. 2abc

D. none of these

Answer: C

Watch Video Solution

44. Let $f(x) = e^x \sin x$, slope of the curvery y=f(x) is maximum at x=a if 'a' equals

A. 0

B. $\pi/4$

C. $\pi/2$

D. none of these

Answer: C

Watch Video Solution

45. If $a > b > 0$ then maximum value of

$$\frac{ab\left(a^2 - b^2\right)\sin x \cos x}{a^2 \sin^2 x + b^2 \cos^2 x}, x \in (0, \pi/2)$$ is

A. $a^2 - b^2$

B. $\frac{a^2 - b^2}{2}$

C. $\frac{a^2 + b^2}{2}$

D. none of these

Answer: B

Watch Video Solution

46. The maximum value of the function $f(x) = \frac{(1+x)^{0.3}}{1+x^{0.3}}$ in [0,1] is

A. 1

B. $2^{0.7}$

C. $2^{-0.7}$

D. $2^{0.3}$

Answer: A

Watch Video Solution

47. If $g(x) = \max\left(y^2 - xy\right)(0 \leq y \leq 1)$, then the minimum value of g(x) (for real x) is

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

B. $3 - \sqrt{8}$

C. $3 + \sqrt{8}$

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

Answer: B

Watch Video Solution

48. Let $f(x) = \frac{\sin x - \cos x + \sqrt{2}}{x^{3/2}}$, where $x \in \left[\frac{\pi}{4}, \frac{5\pi}{4}\right]$. Let m be the maximum value of F(x) and M be the minimum value of F(x). Then $\left[\frac{2M}{5m}\right]$ is equal to ([.]) denotes the greatest interger function

A. 3

B. 2

C. 4

D. 6

Answer: C

View Text Solution

49. If a,b,c are positive constants such that $a > b$ then the maximum value of r, given by $\frac{c^4}{r^2} = \frac{a^2}{\sin^2\theta} + \frac{b^2}{\cos^2\theta}$, must be

A. $\frac{c^2}{a-b}$

B. $\frac{c^2}{a+b}$

C. $\frac{c^2}{\sin^2\theta}$

D. $\frac{c^2}{\sqrt{ab}}$

Answer: B

Watch Video Solution

50. Let $f(x) = In\left(2x - x^2\right)\sin\frac{\pi x}{2}$. Then

A. Graph of is symmetrical about the line x=1

B. Graph of is symmetrical about the line x=2

C. Maximum value of f(x) is 1

D. Minimum value of f(x) does not exits

Answer: A:C::D

View Text Solution

Chapter Test

1. The maximum value of $\left(\frac{1}{x}\right)^{2x^2}$ IS =

A. e

B. $\sqrt[e]{e}$

C. `

D. $e^{1/e}$

Answer: B

Watch Video Solution

2. If $ax^2 + \frac{b}{x} \geq c$ for all positive x where $a > 0$ and $b > 0$, show that $27ab^2 \geq 4c^3$.

A. $27ab^2 \geq 4c^3$

B. $27ab^2 < 4c^3$

C. $4ab^2 \geq 27c^3$

D. none of these

Answer: A

Watch Video Solution

3. The greatest value of the funxtion $f(x) = xe^{-x}$ in $[0, \infty]$ is

A. 0

B. $1/e$

C. $-e$

D. e

Answer: B

Watch Video Solution

4. Let $f(x) = x^3 - 6x^2 + 12x - 3$. Then at x=2 f(x) has

A. a maximum

B. a minimum

C. both a maximum and a minimum

D. neither a maximum nor a minimum

Answer: D

Watch Video Solution

5. In the right triangle $BAC, \angle A = \frac{\pi}{2}$ and $a + b = 8$. The area of the triangle is maximum when $\angle C$, is

A. $\pi/3$

B. $\pi/4$

C. $\pi/6$

D. $\pi/2$

Answer: A

Watch Video Solution

6. The range of values of a for which the function

$$f(x) = \left(a^2 - 7a + 12\right)\cos x + 2(a-4)x + 3e^5$$

does not process critical points is

A. (1,5)

B. $(1, 4) \cup (4, 5)$

C. (1,4)

D. none of these

Answer: B

Watch Video Solution

7. If the function

$$f(x) = (2a - 3)(x + 2\sin 3) + (a - 1)\left(\sin^4 x + \cos^4 x\right) + \log 2$$

does not process critical poits , then

A. $a \in (\infty, 4/3) \cup (2, \infty)$

B. $a \in (4/3, 2)$

C. $a \in (4/3, \infty)$

D. $a \in (2, \infty)$

Answer: A

Watch Video Solution

8. The function $f(x) = \dfrac{ax + b}{(x - 1)(x - 4)}$ has a local maxima at (2,-1), then

A. a=0, b=1

B. a=0,b=-1

C. a=1, b=0

D. a=-1,b=0

Answer: C

Watch Video Solution

9. For $x > 1$, the minimum value of $2\log_{10}(x) - \log_x(0.01)$ is

A. 1

B. -1

C. 2

D. $1/2$

Answer: D

Watch Video Solution

10. The maximum valu of the function f(x) given by

$f(x) = x(x-1)^2, 0 < x < 2$, is

A. 0

B. $4/27$

C. -4

D. $1/4$

Answer: B

Watch Video Solution

11. The least value of a for which the equation $\frac{4}{\sin x} + \frac{1}{1-\sin x} = a$ has at least one solution in the interval $\left(0, \frac{\pi}{2}\right)$ 9 (b) 4 (c) 8 (d) 1

A. `4

B. 1

C. 3

D. 9

Answer: C

Watch Video Solution

12. The minimum value of $f(x) = e^{(x^4 - x^3 + x^2)}$ is

A. e

B. e^2

C. 1

D. e^{-1}

Answer: C

Watch Video Solution

13. If the function $f(x) = \frac{a}{x} + x^2$ has a maximum at x=-3 then a=

A. -1

B. 16

C. 1

D. 4

Answer: D

Watch Video Solution

14. Find the maximum value of $4\sin^2 x + 3\cos^2 + \frac{\sin x}{2} + \frac{\cos x}{2}$.

A. 4

B. $3 + \sqrt{2}$

C. $4 + \sqrt{2}$

D. $2 + \sqrt{2}$

Answer: C

Watch Video Solution

15. The least value of the f(x) given by

$f(x) = \tan^{-1} x - \frac{1}{2}\log_e x$ in the interval $\left[1/\sqrt{3}, \sqrt{3}\right]$, is

A. $\frac{\pi}{6} + \frac{1}{4}\log_e 3$

B. $\frac{\pi}{3} - \frac{1}{4}\log_e 3$

C. $\frac{\pi}{6} - \frac{1}{4}\log_e 3$

D. $\frac{\pi}{3} + \frac{1}{4}\log_e 3$

Answer: B

Watch Video Solution

16. The slope of the tangent to the curve $y = e^x \cos x$ is minimum at $x = a, 0 \leq a \leq 2\pi$, then the value of a is

A. 0

B. π

C. 2π

D. $3\pi/2$

Answer: B

Watch Video Solution

17. The value of a for which the function

$$f(x) = \begin{cases} \tan^{-1} a - 3x^2 & , \quad 0 < x < 1 \\ -6x & , \quad x \geq 1 \end{cases}$$ has a maximum at x=1 , is

A. 0

B. 1

C. 2

D. none of these

Answer: D

Watch Video Solution

18. The minimum value of $27^{\cos 3x} 81^{\sin 3x}$ is

A. $1/243$

B. -5

C. $1/5$

D. $1/3$

Answer: A

Watch Video Solution

19. If $f(x) = \dfrac{x^2 - 1}{x^2 + 1}$, for every real x, then the maximum value of f

A. does not exits because f- is unbounded

B. is not attained even though f is bounded

C. is equal to 1

D. is equal to -1

Answer: D

Watch Video Solution

20. $f(x) = |x| + |x-1| + |x-2|$, then which one of the following is not correct ?

A. f(x) has a minimum at x=1

B. f(x) has a maximum at x=0

C. f(x) has niether a maximum nor a minimum at x=0

D. f(x) has niether a maximum nor a minimum x=2

Answer: B

Watch Video Solution

21. The maximum value of $f(x) = \frac{\log x}{x} (x \neq 0, x \neq 1)$ is

A. $1/e$

B. e

C. $2/e$

D. 1

Answer: A

Watch Video Solution

22. The function $f(x) = 2x^3 - 3x^2 - 12x - 4$ has

A. no maxima and minima

B. one maximum and one minimum

C. twon maxima

D. two minima

Answer: B

Watch Video Solution

23. In (-4,4) the function $f(x) = \int_{-10}^{x} (t^2 - 4)e^{-4t}dt$, has

A. no extrema

B. one extremum

C. two extrema

D. four ectrema

Answer: C

Watch Video Solution

24. On [1,e] the gratest value of $x^2 \log_e x$, is

A. e^2

B. $\frac{1}{2}\log\left(\frac{1}{\sqrt{e}}\right)$

C. $e^2 \log \sqrt{e}$

D. e

Answer: A

View Text Solution

25. Let $f(x) = \{x + 2, \ -1 \leq \ < 0$

$1, x = 0\frac{x}{2}, 0 < x \leq 1$

A. a minimum

B. a maximum

C. either a maximum or a minimum

D. niether a maximum nor a minimum

Answer: D

Watch Video Solution

26. If $f(x) = \frac{x^2 - 1}{x^2 + 1}$, for every real x, then the maximum value of f

A. does not exits because f is unbounded

B. is not attained even though f is bounded

C. is equal to 1

D. is equal to -1

Answer: D

Watch Video Solution

27. The function $f: R \to R$ 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 decreasing on R

D. in increasing function on R

Answer: D

Watch Video Solution

28. The maximum distance from origin of a point on the curve $x = a\sin t - b\sin\left(\frac{at}{b}\right), y = a\cos t - b\cos\left(\frac{at}{b}\right)$, borth a,b>0 is

A. a-b

B. a+b

C. $\sqrt{a^2 + b^2}$

D. $\sqrt{a^2 - b^2}$

Answer: B

Watch Video Solution

29. The maximum value of $x^{1/x}$ is

A. $1/e$

B. e

C. $e^{1/e}$

D. $1/e$

Answer: C

Watch Video Solution

30. The perimeter of a sector is a constant. If its area is to be maximum, the sectorial angle is

A. $\frac{\pi^c}{6}$

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

C. 4^c

D. 2^c

Answer: D

Watch Video Solution