MATHS

BOOKS - TARGET MATHS (HINGLISH)

APPLICATIONS OF DERIVATIVES

Classical Thinking

1. The slope of the tangent to the curves $x = 3t^2 + 1, y = t^3 - 1$ at t=1 is

A. 0

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

C. 1

D. -2

Answer: B

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2. Slope of normal to the curve $y = x^2 - x$ and x=2 is

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

B. $-\frac{1}{7}$

C. $-\frac{1}{9}$

D. $-\frac{1}{11}$

Answer: D

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3. The tangent to a given cuve is perpendicualr to x-axis, if

A. $\frac{dy}{dx} = 0$

B. $\frac{dy}{dx} = 1$

C. $\frac{dx}{dy} = 0$

D. $\frac{dx}{dy} = 1$

Answer: C

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4. The abscissa of the points, where the tangent to curve $y = x^3 - 3x^2 - 9x + 5$ is parallel to X-axis are

A. x=0 and 1

B. x=1 and -1

C. x=1 and -3

D. x=-1 and 3

Answer: D

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5. Equation of the tangent at $(-4, -4)$ on $x^2 = -4y$ is

A. 2x+y+4=0

B. 2x-y-12=0

C. 2x+y-4=0

D. 2x-y+4=0

Answer: D

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6. Find the equation of the tangent to the curve $\sqrt{x} + \sqrt{y} = a$ at the point $\left(\frac{a^2}{4}, \frac{a^2}{4}\right)$

A. $xy = a^2$

B. $x + y = \frac{a^2}{2}$

C. $xy = \frac{a^2}{2}$

D. $x - y = \frac{a^2}{2}$

Answer: B

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7. The equation of normal to the curve $y = x^2 - 2x + 1$ at (0,1) is

A. x-2y+2=0

B. x+2y+2=0

C. 4x+2y+8=0

D. 4x-4y+2=0

Answer: A

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8. The equation of the normal to the curve $y = \sin\frac{\pi x}{2}$ at (1,1) is

A. y=1

B. x=1

C. y=x

D. $y-1=\frac{-2}{\pi}(x-1)$

Answer: B

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9. The equation of tangent to the curve $y=2\sin x$ at $x=\frac{\pi}{4}$ is

A. $y-\sqrt{2}=2\sqrt{2}\left(x-\frac{\pi}{4}\right)$

B. $y+\sqrt{2}=\sqrt{2}\left(x+\frac{\pi}{4}\right)$

C. $y-\sqrt{2}=-\sqrt{2}\left(x-\frac{\pi}{4}\right)$

D. $y-\sqrt{2}=\sqrt{2}\left(x-\frac{\pi}{4}\right)$

Answer: D

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10. The equation of the tangent to the curve $y = 4 + \cos^2 x$ at $x = \frac{\pi}{2}$ is

A. y=4

B. y+4=0

C. y=0

D. y+2=0

Answer: A

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11. Find the equation of the tangent to the curve $y = x - \sin x \cos x$ at $x = \frac{\pi}{2}$

A. $y = 2x - \frac{\pi}{2}$

B. $2x = y + \frac{\pi}{2}$

C. $x = y - \frac{\pi}{2}$

D. $x = y + \frac{\pi}{2}$

Answer: A

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12. The equation of the tangent to the curve $y = 2\sin x + \sin 2x$ at $x = \frac{\pi}{3}$ is equal to

A. $2y = 3\sqrt{3}$

B. $y = 3\sqrt{3}$

C. $2y + 3\sqrt{3} = 0$

D. $y + 3\sqrt{3} = 0$

Answer: A

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13. The equation of normal to the curve $y = 2\cos x$ at $x = \frac{\pi}{4}$ is

A. $y - \sqrt{2} = 2\sqrt{2}\left(x - \frac{\pi}{4}\right)$

B. $y + \sqrt{2} = 2\sqrt{2}\left(x + \frac{\pi}{4}\right)$

C. $y - \sqrt{2} = \frac{1}{\sqrt{2}}\left(x - \frac{\pi}{4}\right)$

D. $y - \sqrt{2} = \sqrt{2}\left(x - \frac{\pi}{4}\right)$

Answer: C

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14. The acceleration of a moving particle whose space time equation is given by $s = 3t^2 + 2t - 5$, is

A. 6

B. 5

C. 0

D. 1

Answer: A

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15. The displacement of a particle in time t is given by $s = 2t^2 - 3t + 1$. The acceleration is

A. 1

B. 3

C. 4

D. 5

Answer: C

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16. A particle is moving in a straight line according as $s = 45t + 11t^2 - t^3$ then the time when it come to rest is

A. $-9 \sec onds$

B. $\frac{5}{3}$seconds

C. $9 \sec onds$

D. $-\frac{5}{3}$ seconds

Answer: C

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17. If the distance s travelled by a particle in time t is $s = a \sin t + b \cos 2t$, then the acceleration at $t = 0$ is

A. a

B. $-a$

C. 4b

D. $-4b$

Answer: D

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18. The equation of motion of a particle moving along a straight line is $s = 2t^3 - 9t^2 + 12t$, where the units of s and t are centrimetre and second. The acceleration of the particle will be zero after

A. $\frac{3}{2}$sec

B. $\frac{2}{3}$sec

C. $\frac{1}{2}$sec

D. 2 sec

Answer: A

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19. A stone is falling freely and describes a distance s in t seconds given by equation $s = \frac{1}{2}\text{gt}^2$.

The acceleration of the stone is

A. Uniform

B. Zero

C. Non-uniform

D. Indeterminate

Answer: A

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20. The radius of a circle is increasing uniformly at the rate of 3 cm/s. Find the rate at which the area of the circle is increasing when the radius is 10 cm.

A. $\pi cm^2 / s$

B. $2\pi cm^2 / s$

C. $10\pi cm^2 / s$

D. $60\pi cm^2 / \sec$

Answer: D

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21. Sides of a square are increasing at the rate 0.5$cm/\sec$. When the side is 10 cm long, its area is increasing at the rate of

A. $100cm^2/\sec$

B. $0.10cm^2/\sec$

C. $10cm^2/\sec$

D. $1cm^2/\sec$

Answer: C

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22. The volume V and depth x of water in a vessel are connected by the relation $V=5x-\frac{x^2}{6}$ and the volume of water is increasing at the rate of $5cm^3/\sec$ when x=2cm. The rate at which the depth of water is increasing , is

A. $\frac{5}{18}cm/\sec$

B. $\frac{1}{4}cm/\sec$

C. $\frac{5}{16}cm/\sec$

D. $\frac{15}{13}cm/\sec$

Answer: D

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23. The aproximate value of square root of 25.2 is

A. 5.10

B. 5.02

C. 5.002

D. 5.04

Answer: B

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24. Use differentials and find approximate value of $(29)^{1/3}$

A. 3.72040

B. 3.07407

C. 3.4702

D. 3.2740

Answer: B

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25. Rolle's theorem is true for the function $f(x) = x^2 - 4$ in the interval

A. $[-2, 0]$

B. $[-2, 2]$

C. $\left[0, \frac{1}{2}\right]$

D. $[0, 2]$

Answer: B

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26. If, from mean value theorem ,

$f(x_1) = \frac{f(b) - f(a)}{b - a}$, then:

A. $a < x_1 \leq b$

B. $a \leq x_1 < b$

C. $a < x_1 < b$

D. $a \leq x_1 \leq b$

Answer: C

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27. The function $f(x) = 2 - 3x$ is

A. increasing

B. decreasing

C. neither decreasing nor increasing

D. None of these

Answer: B

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28. The function f(x) =x^2 is increasing in the interval

A. (-1,1)

B. $(-\infty, \infty)$

C. $(0, \infty)$

D. $(-\infty, 0)$

Answer: C

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29. The function $f(x) = ax + b$ is strictly decreasing for all $x \varepsilon R$ if

A. a=0

B. $a < b$

C. $a > 0$

D. None of these

Answer: B

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30. For every value of x the function $f(x) = \frac{1}{5^x}$ is

A. Decreasing

B. Increasing

C. Neither Increasing nor decreasing

D. Increasing for $x > 0$ and decreasing for $x < 0$

Answer: A

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31. In case of strictly decreasing function, the derivative is

A. negative

B. zero

C. positive

D. either positive or zero

Answer: A

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32. The function $x^4 - 4x$ is decreasing in the interval

A. [-1,1]

B. $(-\infty, 1)$

C. $[1, \infty)$

D. $(-\infty, 4)$

Answer: B

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33. The function f defined by $f(x) = 4x^4 - 2x + 1$ is increasing for

A. $x < 1$

B. $x > 0$

C. $x < \frac{1}{2}$

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

Answer: D

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34. The function $f(x) = 2x^3 + 9x^2 + 12x + 20$ is increasing in the interval

A. $(-\infty, -1)$

B. $(2, \infty)$

C. $(-\infty, -2) \cup (-1, \infty)$

D. $(-2, \infty)$

Answer: C

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35. The value of x for which the function f given by $f(x) = 2x^3 - 3x^2 - 12x + 12$ is increasing in

A. $(-\infty, -1) \cup (2, \infty)$

B. $(-\infty, -4) \cup (2, \infty)$

C. $(-\infty, 0) \cup (2, \infty)$

D. $(-\infty, -2) \cup (2, \infty)$

Answer: A

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36. The function $f(x) = x^3 - 6x^2 + 9x + 3$ is decreasing for

A. $(-\infty, -1) \cap (3, \infty)$

B. (1,3)

C. $(3, \infty)$

D. (1,4)

Answer: B

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37. $2x^3 - 6x + 5$ is an increasing function, if

A. $0 < x < 1$

B. $-1 \leq x \leq 1$

C. $x < -1$ or $x > 1$

D. $-1 < x < \frac{1}{2}$

Answer: C

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38. The function $f(x) = \frac{1}{1+x^2}$ is decreasing in the interval

A. $(-\infty, -1]$

B. $(-\infty, 0]$

C. $[1, \infty)$

D. $(0, \infty)$

Answer: D

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39. On the interval $\left(0, \frac{\pi}{2}\right)$ the function $\log \sin x$ is

A. increasing

B. decreasing

C. Neither Increasing nor decreasing

D. None of these

Answer: A

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40. The interval for which the given function $f(x) = 2x^3 - 3x^2 - 36x + 7$ is decreasing , is

A. (-2,3)

B. (2,3)

C. (2,∞)

D. (-3,∞)

Answer: A

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41. The function $f(x) = 2x^3 - 3x^2 - 12x + 5$ has a minimum at x=

A. -1

B. 2

C. $-\frac{1}{2}$

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

Answer: B

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42. The sufficient conditions for the function $f, R \rightarrow R$ to be maximum at x=a will be

A. $f'(a) > 0$ and $f''(a) > 0$

B. $f'(a) = 0$ and $f''(a) = 0$

C. $f'(a) = 0$ and $f''(a) < 0$

D. $f'(a) > 0$ and $f''(a) < 0$

Answer: C

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43. The minimum value of the function $f(x) = 7 - 20x + 11x^2$ is

A. $\frac{177}{11}$

B. $-\frac{177}{11}$

C. $-\frac{23}{11}$

D. $\frac{23}{11}$

Answer: C

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44. The minimum value of $2x^2 + x - 1$ is

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

B. $\frac{3}{2}$

C. $\frac{-9}{8}$

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

Answer: C

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

A. No maxima and minima

B. One maximum and one minimum

C. Two maxima

D. Two minima

Answer: B

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46. The function y=1-cos x is maximum , when x=

A. 0

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

C. π

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

Answer: C

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Critical Thinking

1. Inclination of the normal to the curve $xy=15$ at the point $(3, 5)$ is

A. $\tan^{-1}\left(\frac{15}{9}\right)$

B. $-\tan^{-1}\left(\frac{9}{15}\right)$

C. $\tan^{-1}\left(\frac{9}{15}\right)$

D. $-\tan^{-1}\left(\frac{15}{9}\right)$

Answer: C

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2. Tangent to the curve $x^2 = 2y$ at the point $\left(1, \frac{1}{2}\right)$ makes with the X-axes an angle of

A. 0°

B. 45°

C. 30°

D. 60°

Answer: B

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3. At what point on the curve $x^3 - 8a^2y = 0$ the slope of the normal is $-2/3$?

A. (a,a)

B. (2a,-a)

C. (2a,a)

D. None of these

Answer: C

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4. The points on the curve $x^2 = 3 - 2y$, where the tangent is parallel to x+y=2, is

A. (1,1)

B. (-1,3)

C. $(\sqrt{3}, 0)$

D. (3,-3)

Answer: A

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5. If the tangent to the curve $y = 6x - x^2$ is parallel to line 4x-2y-1=0, then the point of tangency on the curve is

A. (2,8)

B. (8,2)

C. (6,1)

D. (4,2)

Answer: A

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6. If the tangent to the curve $y = 2x^2 - x + 1$ at a point P is parallel to y=3x+4, the co-ordinates of P are

A. (2,1)

B. (1,2)

C. (-1,2)

D. (2,-1)

Answer: B

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7. Co-ordinates of a point on the curve $y=x\log x$ at which at normal is parallel to the line $2x-2y=3$ are

A. (0,0)

B. (e,e)

C. $\left(e^2, 2e^2\right)$

D. $\left(e^{-2}, -2e^{-2}\right)$

Answer: D

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8. Find the point on the parabola $y=(x-3)^2$, where the tangent is parabola to the line joining (3,0) and (4,1

A. $\left(\frac{5}{2}, \frac{1}{4}\right)$

B. $\left(\frac{5}{2}, \frac{3}{4}\right)$

C. $\left(\frac{7}{2}, \frac{1}{4}\right)$

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

Answer: C

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9. The fixed point P on the curve $y=x^2-4x+5$ such that the tangent at P is perpendicular to the line $x+2y-7=0$ is given by

A. (1,2)

B. (2,1)

C. (3,2)

D. (2,3)

Answer: C

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10. The tangent to the curve $x^2 + y^2 - 2x - 3 = 0$ is parallel to X-axis at the points

A. $(2, \pm\sqrt{3})$

B. $(1, \pm 2)$

C. $(\pm 1, 2)$

D. $(\pm 3, 0)$

Answer: B

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11. The point (s) on the curve $y^3 + 3x^2 = 12y$. Where the tangent is parallel to Y- axis , is (are)

A. $\left(\pm\frac{4}{\sqrt{2}}, -2\right)$

B. $\left(\pm\sqrt{\frac{11}{2}}, 1\right)$

C. (0,0)

D. $\left(\pm\frac{4}{\sqrt{3}}, 2\right)$

Answer: D

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12. The tangent to the curve $y = ax^2 + bx$ at (2,-8) is parallel to X-axis then

A. a=2,b=-2

B. a=2,b=-4

C. a=2,b=-8

D. a=4,b=-4

Answer: C

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13. If the curve $y = ax^2 - 6x + b$ pass through $(0, 2)$ and has its tangent parallel to the x-axis at $x = \frac{3}{2}$, then find the values of $aandb$.

A. 2 and 2

B. $-2 \text{ and } -2$

C. $-2 \text{ and } 2$

D. $2 \text{ and } -2$

Answer: A

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14. The equation of normal to the curve $x = \frac{1}{t}, y = t - \frac{1}{t}$ at $t = 2$ is

A. x+5y+7=0

B. 5x+y+7=0

C. x-5y+7=0

D. 5x-y+7=0

Answer: C

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15. The equation of tangent to the curve $x = a\sec\theta, y = a\tan\theta$ at $\theta = \frac{\pi}{6}$ is

A. $2\sqrt{3}x - y = -\sqrt{3}a$

B. $2\sqrt{3}x + y = a$

C. $2x - y = \sqrt{3}a$

D. $2\sqrt{3}x + y = \sqrt{3}a$

Answer: C

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16. Equations to the tangent and normal to curve $y = x^3 + 2x^2 - 4x - 43$ at the point (-2,5) are respectively

A. y=5, x+2=0

B. y+5=0,x=2

C. x=2,y=5

D. x+2=0,y+5=0

Answer: A

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17. If the normal line at $(1, -2)$ on the curve $y^2 = 5x - 1$ is $ax - 5y + b = 0$ then the values of a and b are

A. 4,-14

B. 4,14

C. $-4, 14$

D. $-4, \ -14$

Answer: A

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18. The equation of normal to the curve $x^{2/3} + y^{2/3} = a^{2/3}$ at $(a\sin^3\theta, a\cos^3\theta)$ is

A. $x\sin\theta - y\cos\theta = a\sin^4\theta - a\cos^4\theta$

B. $x\sin\theta + y\cos\theta = a\sin^4\theta + a\cos^4\theta$

C. $x\sin\theta - y\cos\theta = a\sin^4\theta + a\cos^4\theta$

D. $x\sin\theta + y\cos\theta = a\sin^4\theta - a\cos^4\theta$

Answer: A

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19. The equation of the tangent to the curve $y = x + \frac{4}{x^2}$, I thant is parallel to the X-axis, is

A. y=2

B. y=3

C. y=0

D. y=1

Answer: B

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20. Find the equation of the tangent to the curve $(1 + x^2)y = 2 - x$, where it crosses the x-axis.

A. x+5y=2

B. x-5y=2

C. 5x-y=2

D. 5x+y=2

Answer: A

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21. The equation of the tangent to the curve $y = be^{-x/a}$ at the point where it crosses the y-axis is $\frac{x}{a} - \frac{y}{b} = 1$ (b) $ax + by = 1$ $ax - by = 1$ (d) $\frac{x}{a} + \frac{y}{b} = 1$

A. ax+by=1

B. ax-by=1

C. $\frac{x}{a} - \frac{y}{b} = 1$

D. $\frac{x}{a} + \frac{y}{b} = 1$

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. (-2,0)

B. (2,0)

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

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

Answer: C

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23. The line $\frac{x}{a} + \frac{y}{b} = 1$ touches the curve $y = be^{-x/a}$ at the point

A. (0,0)

B. (0,a)

C. (0,b)

D. (b,0)

Answer: C

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24. The equation of the normal to the curve $y=(1+x)^y+\sin^{-1}\left(\sin^2 x\right)$ at $x=0$ is :

A. x+y=2

B. x+y=1

C. x-y=1

D. x-y=2

Answer: B

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

A. 2x-y+5=0

B. 2x+y+5=0

C. 4x-y+5=0

D. 4x+y+5=0

Answer: C

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26. If line T_1 touches the curve $8y = (x - 2)^2$ at (-6,8) and line T_2 touches the curve $y = x + \frac{3}{x}$ at (1,4), then

A. T_1 is parallel to T_2

B. T_1 is not parallel to T_2

C. T_1 is perpendicular to T_2

D. None of these

Answer: A

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27. If the line $ax + by + c = 0$ is a normal to the curve $xy = 1$, then $a > 0, b > 0$ $a > 0, b < 0$ $a\langle 0, b\rangle 0$ (d) $a < 0, b < 0$ none of these

A. $a > 0, b > 0$

B. $a > 0, b < 0$ or $a < 0, b > 0$

C. $a < 0, b < 0$

D. None of these

Answer: B

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28. The line lx+my+n=0 is a tangent to the curve $y = x - x^2 + x^3$, then

A. $l > 0, m > 0$

B. $l < 0, m < 0$

C. $lm > 0$

D. $lm < 0$

Answer: D

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29. Find the value of $n \in N$ such that the curve $\left(\frac{x}{a}\right)^n + \left(\frac{y}{b}\right)^n = 2$ touches the straight line $\frac{x}{a} + \frac{y}{b} = 2$ at the point (a, b).

A. 2

B. 3

C. 4

D. any real number

Answer: D

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30. The area of the traingle formed by the coordinate axes and a tangent to the curve $xy = a^2$ at the point (x_1, y_1) is

A. $\frac{a^2 x_1}{y_1}$

B. $\frac{a^2 y_1}{x_1}$

C. $2a^2$

D. $4a^2$

Answer: C

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31. The angle of intersection of the curves $y = x^2, 6y = 7 - x^3$ at (1, 1), is

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

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

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

D. π

Answer: C

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32. The acute angle between the curve $y^2 = x$ and $x^2 = y$ at (1,1) is

A. $\tan^{-1}\left(\frac{4}{5}\right)$

B. $\tan^{-1}\left(\frac{3}{4}\right)$

C. $\tan^{-1}(1)$

D. $\tan^{-1}\left(\frac{4}{3}\right)$

Answer: B

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33. If the curves $y = a^x$ and $y = e^x$ intersect at and angle α, then $\tan \alpha$ equals

A. $\dfrac{a - b}{1 + ab}$

B. $\dfrac{\log a - \log b}{1 + \log a \log b}$

C. $\dfrac{a + b}{1 - ab}$

D. $\dfrac{\log a + \log b}{1 - \log a \log b}$

Answer: B

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34. The distance in seconds, described by a particle in t seconds is given by $s = ae^t + \dfrac{b}{e^t}$. The acceleration of the particle at time t is

A. proportional to t

B. Proportional to v

C. s

D. constant

Answer: C

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35. A particle is moving in a striaght line according as $S = 15t + 6t^2 - t^3$, then the time it will come to rest is

A. $-18 \sec$

B. 10 sec

C. 5 sec

D. $-5 \sec$

Answer: C

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36. A particle moves in a straight line so that $s = \sqrt{t}$, then its acceleration is proportional to

A. $(velocity)^3$

B. velocity

C. $(velocity)^2$

D. $(velocity)^{3/2}$

Answer: A

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37. A particle moves a distance x in time t according to equation $x^2 = 1 + t^2$. The acceleration of the particle is

A. acc. Varies as s^3

B. acc.varies as $\frac{1}{s}$

C. acc.varies as $\frac{1}{s^3}$

D. acc. Varies as $\frac{1}{s^2}$

Answer: C

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38. IF the radius of a circle increases from 3 cm to 3.2 cm, then the increase in the area of the circle is

A. $1.2\pi cm^2$

B. $12\pi cm^2$

C. $6\pi cm^2$

D. $0.6\pi cm^2$

Answer: A

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39. The length of the side of a square sheet of metal is increasing at the rate of $4cm/\sec$. The rate at which the area of the sheet is increasing when the length of its side is 2cm, is

A. $16cm^2/\sec$

B. $8cm^2/\sec$

C. $32cm^2/\sec$

D. $4cm^2/\sec$

Answer: A

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40. If a spherical balloon has a variable diameter $(3x + 9/2)$., then the rate of change of its volume w. r. t x is

A. $27\pi(2x + 3)^2$

B. $\frac{27\pi}{16}(2x + 3)^2$

C. $\frac{27\pi}{8}(2x+3)^2$

D. $\frac{27\pi}{4}(2x+3)^2$

Answer: C

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41. If the radius of a circle be increasing at a uniform rate of $2cms^{-1}$. The rate of increasing of area of circle, at the instant when the radius is 20 cm is

A. $70\pi cm^2 / \sec$

B. $70cm^2 / \sec$

C. $80\pi cm^2 / \sec$

D. $80cm^2 / \sec$

Answer: C

Watch Video Solution

42. Gas is being pumped into a a spherical balloon at the rate of $30ft^3 / \min$. Then the rate at which the radius increases when it reaches the value 15 ft, is

A. $\frac{1}{30\pi}ft / \min$

B. $\frac{1}{15\pi}ft / \min$

C. $\frac{1}{20}ft / \min$

D. $\frac{1}{25}ft / \min$

Answer: A

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43. The edge of a cube is increasing at the rate of $5cm / \sec$. How fast is the volume of the cube increasing when the edge is 12 cm long?

A. $432cm^3 / \sec$

B. $2160 cm^3 / \sec$

C. $180 cm^3 / \sec$

D. $1920 cm^3 / \sec$

Answer: B

Watch Video Solution

44. If the edge of a cube increases at the rate of $60 cm$ per second, at what rate the volume in increasing when the edge is $90 cm$

A. $486000 cm^3 / \sec$

B. $1458000 cm^3 / \sec$

C. $43740000 cm^3 / \sec$

D. None of these

Answer: B

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45. A spherical iron ball 10cm in radius is coated with a layer of ice of uniform thickness that melts at a rate of $50cm^3 / m \in$. When the thickness of ice is 5cm, then find the rate at which the thickness of ice decreases.

A. $\frac{1}{54\pi} cm / \min$

B. $\frac{5}{6\pi} cm / \min$

C. $\frac{1}{36\pi} cm / \min$

D. $\frac{1}{18\pi} cm / \min$

Answer: D

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46. The diagonal of square is changing at the rate of $0.5cms^{-1}$. Then the rate of change of area, when the area is $400cm^2$, is equal to

A. $20\sqrt{2}cm^2/\sec$

B. $10\sqrt{2}cm^2/\sec$

C. $\frac{1}{10\sqrt{2}}cm^2/\sec$

D. $\frac{10}{\sqrt{2}}cm^2/\sec$

Answer: B

Watch Video Solution

47. 2 m ऊंचाई का आदमी 6 m ऊंचे बिजली के खंभे से दूर 5 km/h की समान चाल से चलता है| उसकी छाया की लमबायी की वृद्धि की दर ज्ञात कीजिए |

A. $5m/h$

B. $\frac{5}{2}m/h$

C. $\frac{5}{3}m/h$

D. $\frac{5}{4}m/h$

Answer: B

Watch Video Solution

48. A ladder of length $17m$ rests with one end agains a vertical wall and the other on the vessel ground. If the lower end slips away at the rate of $1ms^{-1}$, then when it is $8m$ away from the wall, its upper end is coming down at the rate of

A. $\frac{5}{8}m/\sec$

B. $\frac{8}{15}m/\sec$

C. $\frac{5\pi}{8}m/\sec$

D. $\frac{8}{5}m/\sec$

Answer: B

Watch Video Solution

49. A kite is moving horizontally at a height of $151.5m$. If the speed of the kite is $10\frac{m}{s}$, how fast is the string being let out, when the kite is 250 m away from the boy who is flying the kite? The height of the boy is 1.5 m.

(A) 8 m/s (B) 12 m/s (C) 16 m/s (D) 19 m/s

A. $4m/s$

B. $8m/s$

C. $16m/s$

D. $32m/s$

Answer: B

Watch Video Solution

50. A ladder 20 ft long has one end on the ground and the other end in contact with a vertical wall. The lower end slips along the ground. If the lower end of the ladder is 16 t away from the wall, upper end is moving λ time as fast as the lower end, then λ is

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

B. $\frac{2}{3}$

C. $\frac{4}{3}$

D. $\frac{5}{3}$

Answer: C

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51. Find the approximate values of :

$f(x) = x^3 - 3x + 5 \text{ at } x = 1.99.$

A. 6.91

B. 6.19

C. 6.09

D. 6.29

Answer: A

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52. Find approximate value of $\frac{1}{\sqrt{25.1}}$ using differentials.

A. 0.0196

B. 0.1996

C. 0.0016

D. 0.9006

Answer: B

Watch Video Solution

53. Using differentials, find the approximate value of $\frac{1}{(2.002)^2}$

A. 0.2495

B. 0.2595

C. 0.2095

D. 0.2392

Answer: A

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54. Approximate $(80)^{1/4}$ using differentials

A. 2.0907

B. 2.9907

C. 2.907

D. 2.0097

Answer: B

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55. Find the approximate values of :

$\cot^{-1}(1.001)$

A. 0.7895

B. 0.7845

C. 0.789

D. 0.7865

Answer: B

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56. Approximate value of $\tan^{-1}(0.999)$ is

A. $\frac{\pi}{4} - 0.005$

B. $\frac{\pi}{2} - 0.003$

C. $\frac{\pi}{3} - 0.002$

D. $\frac{\pi}{4} - 0.0005$

Answer: D

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57. $\cos(90^\circ 30')$, approximately given that $1^\circ = 0.0175$ is

A. -0.0875

B. -0.00875

C. 0.00875

D. 0.0875

Answer: B

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58. The apprximate value of $\sin(31^\circ)$, given that $1^\circ = 0.0175, \cos 30^\circ = 0.8660$ is

A. 0.5100

B. 0.5152

C. 0.5295

D. 0.5175

Answer: B

Watch Video Solution

59. The approximate value of

$\tan 46^\circ$ is (given $1^\circ = 0.0175$radians)

A. 1.1349

B. 1.0034

C. 1.035

D. 1.349

Answer: C

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60. IF $\log_e 3 = 1.0986$, then$\log_e (9.01)$ approximately is

A. 1.1983

B. 2.1983

C. 2.1198

D. 3.1883

Answer: B

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61. The Rolle's theorem is applicable in the interval $-1 \leq x \leq 1$ for the function

A. f(x)=x

B. f(x)=x^2

C. f(x)=$2x^3 + 3$

D. f(x)=$|x|$

Answer: B

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62. Rolle's theorem is not applicable to the function $f(x) = |x| \text{for} - 2 \leq x \leq 2$ becase

A. f is continous on [-2,2]

B. f is not differentiable at x=0

C. f(-2)=f(2)

D. f is not a constant function

Answer: B

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63. Consider the function $f(x) = e^{-2x} \sin 2x$ over the interval $\left(0, \frac{\pi}{2}\right)$. A real number $c \in \left(0, \frac{\pi}{2}\right)$, as guaranteed by Rolle's theorem such that

$f'(c) = 0,$ is

A. $\frac{\pi}{8}$

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

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

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

Answer: A

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64. If the functio $f(x)^3 - 6x^2 + ax + b$ satisfies Rolle's theorem in the interval [1,3] and $f'\left(\frac{2\sqrt{3}+1}{\sqrt{3}}\right) = 0$, then

A. a=-11

B. a=-6

C. a=6

D. a=11

Answer: D

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65. The function $f(x)=x(x+3)e^{-\left(\frac{1}{2}\right)x}$ satisfies the conditions of Rolle's theorem in (-3,0). The value of c, is

A. 0

B. -1

C. -2

D. -3

Answer: C

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66. If $f(x)=x^{a}\log x \text{ and } f(0)=0$ then the value of α for which Rolle's theorem can be applied in [0,1] is

A. -2

B. -1

C. 0

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

Answer: D

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67. The value of c in Lagrange's mean value theorem for the function

$f(x) = \log_e x$ in the interval [1,3] is

A. $2\log_3 e$

B. $\frac{1}{2}\log_e 3$

C. $\log_3 e$

D. $\log_e 3$

Answer: A

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68. Varify Lagrange's mean value theorem for the function

$f(x) = x + \frac{1}{x}, x \in [1, 3]$

A. 1

B. $\sqrt{3}$

C. 2

D. 3

Answer: B

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69. From mean value theoren : $f(b) - f(a) = (b-a)f'(x_1); a < x_1 < b$ if $f(x) = \frac{1}{x}$, then x_1 is equal to

A. $\sqrt{ab}$

B. $\dfrac{a+b}{2}$

C. $\dfrac{2ab}{a+b}$

D. $\dfrac{b-a}{b+a}$

Answer: A

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70. The value of c in (0,2) satisfying the Mean Value theorem for the function $f(x) = x(x-1)^2, x\varepsilon[0, 2]$ is equal to

A. $\dfrac{3}{4}$

B. $\dfrac{4}{3}$

C. $\dfrac{1}{3}$

D. $\dfrac{2}{3}$

Answer: B

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71. In the Mean Value theorem $\frac{f(b)-f(a)}{b-a}=f'(c)$ if $a=0, b=\frac{1}{2}$ and f(x)=x(x-1)(x-2) the value of c is

A. $1-\frac{\sqrt{15}}{6}$

B. $1+\sqrt{15}$

C. $1-\frac{\sqrt{21}}{6}$

D. $1+\sqrt{21}$

Answer: C

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72. IF $f(x)=1-x^3-x^5$ is decreasing for

A. $1 \leq x \leq 5$

B. $x \leq 1$

C. $x \geq 1$

D. All values of x

Answer: D

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73. IF $f(x) = 2x^3 + 3x^2 - 12x + 5$, then the interval in which (l_1) increases and (l_2) decreases is

A. $l_1 = (-\infty, -2) \cup (1, \infty), l_2 = (-2, 1)$

B. $l_1 = (-\infty, 1), l_2 = (-1, 2) \cup (2, \infty)$

C. $l_1 = (-\infty, -1) \cup (2, \infty), l_2 = (-1, 2)$

D. $l_1 = (-\infty, 2) \cup (-1, \infty), l_2 = (5, 2)$

Answer: A

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74. The function $f(x) = \frac{x}{1+|x|}$ is differentiable in:

A. not differentiable at x=0

B. strictly increasing

C. strictly decreasing

D. neither increasing nor decreasing

Answer: B

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75. The values of x for which the function $\frac{\log x}{x}$ decreases is

A. $x > 1$

B. $x < 1$

C. $x > e$

D. $x > 3$

Answer: C

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76. IF $f(x) = \frac{1}{x+1} - \log(1+x), x > 0$, then f is

A. an increasing function

B. a decreasing function

C. both increasing and decreasing function

D. None of these

Answer: B

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77. Let $f(x) = x^3 + \frac{3}{2}x^2 + 3x + 3$, then f(x) is

A. a decreasing function

B. an increasing function

C. an odd function

D. an even function

Answer: B

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78. The set of all points for which $f(x) = x^2 e^{-x}$ stricltly increasing is

A. (0,2)

B. (2,∞)

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

D. (-2,0)

Answer: A

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79. If $a < 0$, the function $f(x) = e^{ax} + e^{-ax}$ is a monotonically decreasing function for values of x given by

A. $x > 0$

B. $x < 0$

C. $x > 1$

D. $x < 1$

Answer: B

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80. If $f(x) = kx^3 - 9x^2 + 9x + 3$ is increasing on R then

A. $k > 3$

B. $k < 3$

C. $k \leq 3$

D. None of these

Answer: A

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81. The function $f(x) = \dfrac{\lambda \sin x + 2 \cos x}{\sin x + \cos x}$ is increasing, if (a) $\lambda < 1$ (b) $\lambda > 1$ (c) $\lambda < 2$ (d) $\lambda > 2$

A. $K < 1$

B. $K > 1$

C. $K < 2$

D. $K > 2$

Answer: D

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82. The function which is neither decreasing nor increasing in $\left(\dfrac{\pi}{2}, \dfrac{3\pi}{2}\right)$ is

A. cosec x

B. tan x

C. x^2

D. $|x-1|$

Answer: A

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83. The function $f(x)=x+\frac{1}{x}(x\neq 0)$ is a non-increasing function in the interval

A. [-1,1]

B. [0,1]

C. [-1,0]

D. [-1,2]

Answer: A

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84. The function $\frac{x-2}{x+1}, (x \neq -1)$ is increasing on the interval

A. $(-\infty, 0]$

B. $[0, \infty)$

C. R

D. None of these

Answer: C

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85. The function sinx-bx+c will be increasing in the interval $(-\infty, \infty)$, if

A. $b \leq 1$

B. $b \leq 0$

C. $b < -1$

D. $b \geq 0$

Answer: C

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86. Find the intervals in which the function $f(x) = x^4 - \frac{x^3}{3}$ is increasing or decreasing.

A. Increasing for $x < \frac{1}{4}$ and decreasing for $x > \frac{1}{4}$

B. Increasing for every value of x

C. Decreasing for every value of x

D. None of these

Answer: A

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87. $f(x) = 2x^3 - 15x^2 + 36x + 5$ is decreasing in

A. [2,3]

B. (2,3)

C. $(-\infty, 2)$

D. $(3, \infty)$

Answer: B

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88. Which of the following is correct statement for the functio f(x)=sin2x?

A. f(x) is increasing in $\left(0, \frac{\pi}{2}\right)$ and decreasing in $\left(\frac{\pi}{2}, \pi\right)$

B. f(x) is decreasing in $\left(0, \frac{\pi}{2}\right)$ and increasing in $\left(\frac{\pi}{2}, \pi\right)$

C. f(x) is increasing in $\left(0, \frac{\pi}{4}\right)$ and decreasing in $\left(\frac{\pi}{4}, \frac{\pi}{2}\right)$

D. None of these

Answer: C

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89. The function f(x)=x+cos x is

A. Always increasing

B. Always decreasing

C. Increasing for certain range of x

D. None of these

Answer: A

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90. the function $f(x) = \frac{\log x}{x}$ is increasing in the interval

A. (1,2e)

B. (0,e)

C. (2,2e)

D. $(1/e, 2e)$

Answer: B

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91. The function $f(x) = 1 - e^{-\frac{x^2}{2}}$ is

A. decreasing for all x

B. increasing for all x

C. decreasing for $x \leq 0$ and increasing for $x > 0$

D. Increasing for $x \leq 0$ and decreasing for $x > 0$

Answer: C

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92. If $f(x)=\frac{a\sin x+b\cos x}{c\sin x+d\cos x}$ is decreasing for all x, then

A. $ad-bc<0$

B. $ad-bc>0$

C. $ab-cd>0$

D. $ab-cd<0$

Answer: A

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93. 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. 122

B. 100

C. 120

D. 150

Answer: C

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94. The minimum value of $(x-\alpha)(x-\beta)$ is

A. 0

B. $\alpha\beta$

C. $\frac{1}{4}(\alpha-\beta)^2$

D. $-\frac{1}{4}(\alpha-\beta)^2$

Answer: D

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95. 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

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96. If $f(x) = x^5 - 5x^4 + 5x^3 - 10$ has local maximum and minimum at $x = p$ and $x = q$, respectively, then $(p, q) \equiv$

A. 0,1

B. 1,3

C. 1,0

D. None of these

Answer: B

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97. The function $y = a\log x + bx^2 + x$ has extreme values at $x = 1$ and $x = 2$. Find a and b.

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

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

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

D. $\left(\frac{-2}{3}, \frac{-1}{6}\right)$

Answer: D

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98. The maximum and minimum values for the funtion f(x)=$3x^4 - 4x^3$ on [-1,2] are

A. 7,0

B. 0,-7

C. 16,-1

D. $-7, 16$

Answer: C

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99. The maximum value of function $f(x) = x^3 - 12x^2 + 36x + 17$ in the interval $[1, 10]$ is 17 b. 177 c. 77 d. none of these

A. 17

B. 177

C. 77

D. None of these

Answer: B

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100. If $x + y = 16$ and $x^2 + y^2$ is minimum, then the values of x and y are

A. 3,13

B. 4,12

C. 6,10

D. 8,8

Answer: D

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101. The maximum value of

$f(x) = (x-1)^{\frac{1}{2}}(x-2), 1 \leq x \leq 9$,is

A. 14sqrt(2)

B. 15

C. 17

D. 18

Answer: A

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102. The function $x\sqrt{1-x^2}, (x > 0)$ has

A. A local maxima

B. A local minima

C. Neither a local maxima nor a local minima

D. None of these

Answer: A

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103. The sum of two natural numbers is 10. Their product is maximum if the numbers are

A. x=5,y=5

B. $x = \sqrt{5}, y = 6$

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

D. $x = -5, y = 5$

Answer: A

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104. Maximum area of a rectangle whose perimeter is given as 24 metres is equal to

A. $36m^2$

B. $49m^2$

C. $64m^2$

D. $81m^2$

Answer: A

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105. If sum of two numbers is 3, then maximum value of the product of first and the square of second is

A. 4

B. 3

C. 2

D. 1

Answer: A

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106. The two parts of 100 for which the sum of double of first and square of second part is minimum, are a. 50,50 b. 99,1 c. 98,2 d. none of these

A. 50,50

B. 99,1

C. 98,2

D. None of these

Answer: B

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107. The adjacent sides of a rectangle with given perimeter as 100 cm and enclosing maximum area are

A. 10 cm and 40 cm

B. 20 cm and 30 cm

C. 25 cm and 25 cm

D. 15 cm and 35 cm

Answer: C

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108. The denominator of a fraction is greater than 16 of the square of numerator, then least value of fraction is

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

B. $-\frac{1}{8}$

C. $\frac{1}{12}$

D. $\frac{1}{16}$

Answer: B

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109. x^{2x} has a stationary point at

A. x=e

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

C. x=1

D. $x = \sqrt{e}$

Answer: B

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110. What is the maximum value o fx y subject to the condition x+y=8 ?

A. 8

B. 16

C. 20

D. 24

Answer: B

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111. 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 maxima or minima

Answer: C

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112. The number of values of x where the function $f(x) = \cos x + \cos(\sqrt{2}x)$ attains its maximum is 0 (b) 1 (c) 2 (d) infinite

A. 0

B. 1

C. 2

D. Infinite

Answer: B

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113. The maximum and minimum values of $x^3 - 18x^2 + 96x$ in interval $(0, 9)$ are

A. 160,0

B. 60,0

C. 160 , 128

D. 120,28

Answer: C

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114. If PQ and PR the two sides of a triangle, then the angle between them which gives maximum area of the triangle is

A. π

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

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

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

Answer: D

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115. The maximum and minimum values of the function $|\sin 4x + 3|$ are

A. 1,2

B. 4,2

C. 2,4

D. $-1, 1$

Answer: B

Watch Video Solution

116. The function $f(x) = |pr - 9| + r|x|, x \in (-\infty, \infty)$ where $p > 0, q > 0, r > 0$ assumes its minimum values only at one point if

A. $p \neq q$

B. $q \neq r$

C. $r \neq p$

D. p=q=r

Answer: D

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117. The minimum value of function $f(x) = 3x^4 - 8x^3 + 12x^2 - 48x + 25$ on [0,3] is equal to

A. 25

B. -39

C. -25

D. 39

Answer: B

Watch Video Solution

118. The minimum values of $(x - \alpha)(x - \beta)$ is

A. 0

B. $\alpha\beta$

C. $\frac{1}{4}(\alpha - \beta)^2$

D. $-\frac{1}{4}(\alpha - \beta)^2$

Answer: D

Watch Video Solution

119. Divide 20 into two parts such that the product of the cube of one and the square of the other shall be maximum

A. 10,10

B. 16,4

C. 8,12

D. 12,8

Answer: D

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120. One maximum point of $\sin^p x \cos^q x$ is

A. $x = \tan^{-1}\sqrt{p/q}$

B. $x = \tan^{-1}\sqrt{q/p}$

C. $x = \tan^{-1}(p/q)$

D. $x = \tan^{-1}(q/p)$

Answer: A

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121. A wire of length a is cut into two parts which are bent, respectively, in the form of a square and a circle. The least value of the sum of the areas so formed is $\frac{a^2}{\pi + 4}$ (b) $\frac{a}{\pi + 4}$ $\frac{a}{4(\pi + 4)}$ (d) $\frac{a^2}{4(\pi + 4)}$

A. $\frac{a^2}{\pi + 4}$

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

C. $\frac{a}{4(\pi + 4)}$

D. $\frac{a^2}{4(\pi + 4)}$

Answer: D

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122. The length of the perimeter of a sector of a circle is 20 cm, the maximum area of the sector is

A. $30cm^2$

B. $20cm^2$

C. $40cm^2$

D. $25cm^2$

Answer: D

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123. A running track of 440 ft is to be laid out enclosing a football field, the shape of which is a rectangle with a semi-circle at each end. If the area of the rectangular portion is to be maximum, then find the length of its sides.

A. 110,70

B. 120,60

C. 130,50

D. None of these

Answer: A

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124. A box is to be made from a sheet 12×12 sq.cm, by cutting equals squares from the four corners and turning up its sides. Find the length of the side of the square to be cut out, in order to obtain a box of the largest possible volume?

A. 6

B. 4

C. 3

D. 2

Answer: D

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125. The maximum height is reached is $5s$ by a stone thrown vertically upwards and moving under the equation $10s = 10ut - 49t^2$, where s is in metre and t is in second. The value of u is

A. $4.9m / \sec$

B. $49m / \sec$

C. $98m / \sec$

D. None of these

Answer: B

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126. A man of height 2m walks directly away from a lamp of height 5 m on a level road at $3m/s$. The rate at which the length of his shadow is increasing is

A. $1m/s$

B. $2m/s$

C. $3m/s$

D. $4m/s$

Answer: B

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127. A square plate is contracting at the uniform rate of $2cm^2/\sec$. If side fo the square is 16 cm long, then the rate of decrease of its perimeter is

A. $\frac{1}{2}cm/\sec$

B. $\frac{1}{3}cm/\sec$

C. $\frac{1}{4}cm/\sec$

D. None of these

Answer: C

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128. IF $A+B=\frac{\pi}{2}$, the maximum value of cos Acos B is

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

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

C. 1

D. $\frac{4}{3}$

Answer: A

Watch Video Solution

129. If f(x) satisfies the condition for Rolle's heorem on [3,5] then $\int_3^5 f(x)$ dx equals

A. 2

B. -1

C. 0

D. $-\frac{4}{3}$

Answer: D

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Competitive Thinking

1. Find the slope of the normal to the curve $y = x^2 - \frac{1}{x^2}$ at (-1, 0)

A. 4

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

C. -4

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

Answer: B

Watch Video Solution

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

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

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

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

Answer: A

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3. If the normal to the curve $y = f(x)$ at the point $(3, 4)$ makes an angle $\frac{3\pi}{4}$ with the positive x-axis, then $f'(3) =$ (a) -1 (b) $-\frac{3}{4}$ (c) $\frac{4}{3}$ (d) 1

A. -1

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

C. $\frac{4}{3}$

D. 1

Answer: D

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4. If the slope of the tangent to the curve $y = ax^3 + bx + 4$ at $(2, 14)$ is 21, then the value of a and b are respectively

A. 2,-3

B. 3,-2

C. $-3, \ -2$

D. $2, 3$

Answer: A

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5. For the curve $x = t^2 - 1, y = t^2 - t,$ the tangent line is perpendicular to x-axis, then $t =$ (i)0 (ii)∞ (iii) $\frac{1}{\sqrt{3}}$ (iv) $-\frac{1}{\sqrt{3}}$

A. t=0

B. $t = \infty$

C. $t = \frac{1}{\sqrt{3}}$

D. $t = -\frac{1}{\sqrt{3}}$

Answer: A

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6. If slope of tangent to curve $y = x^3$ at a point is equal to ordinate of point , then point is

A. (27,3)

B. (3,27)

C. (1,2)

D. (-1,3)

Answer: B

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7. Find the coordinates of the point on the curve $y = x^2 - 3x + 2$ where the tangent is perpendicular to the straight line $y = x$

A. (0,2)

B. (1,0)

C. (-1,6)

D. (2,-2)

Answer: B

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8. The point on the curve $y = \sqrt{x - 1}$, where the tangent is perpendicular to the line 2x+y-5=0 is

A. (2,-1)

B. (10,3)

C. (2,1)

D. (5,-2)

Answer: C

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9. If $y = 4x - 5$ is tangent top the curve$y^2 = px^3 + q$ at $(2, 3)$ then

A. p=2,q=-7

B. p=-2,q=7

C. p=-2,q=-7

D. p=2,q=7

Answer: A

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10. If the line y=4x-5 touches to the curve $y^2 = ax^3 + b$ at the point (2,3) then 7a+2b=

A. 0

B. 1

C. -1

D. 2

Answer: A

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11. IF the lines y=-4x+b are tangents to the curve $y = \frac{1}{x}$, then b=

A. ± 4

B. ± 2

C. ± 1

D. ± 8

Answer: A

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12. The point of the curve $y^2 = 2(x - 3)$ at which the normal is parallel to the line $y - 2x + 1 = 0$ si

A. (5,2)

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

C. (5,-2)

D. $\left(\frac{3}{2}, 2\right)$

Answer: C

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13. The total number of points on the curve $x^2 - 4y^2 = 1$ at which the tangents to the curve are parallel to the line x=2y is

A. 0

B. 1

C. 2

D. 4

Answer: A

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14. The normal to the curve $x = a(1 + \cos\theta), y = a\sin\theta \text{ at } '\theta'$ always passes through the fixed point

A. (0,a)

B. (2a,0)

C. (a,0)

D. (a,a)

Answer: C

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15. If $x + y = k$ is normal to $y^2 = 12x$, then k is 3 (b) 9 (c) -9 (d) -3

A. 3

B. 9

C. -9

D. -3

Answer: B

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16. If the line $ax + by + c = 0$ is a tangent to the curve $xy = 4$ then

A. $a < 0, b > 0$

B. $a \leq 0, b > 0$

C. $a < 0, b < 0$

D. $a \leq 0, b < 0$

Answer: C

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17. If the tangent to $y^2 = 4ax$ at the point $\left(at^2, 2at\right)$, where $|t| > 1$ is a normal to $x^2 - y^2 = a^2$ at the point $(a\sec\theta, a\tan\theta)$, then

A. $t = -\cos ec\theta$

B. $t = -\sec\theta$

C. $t = 2\tan\theta$

D. $t = 2\cot\theta$

Answer: A

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

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

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

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

D. None of these

Answer: A

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19. At what points on the curve $y=\frac{2}{3}(x^3)+\frac{1}{2}(x^2)$, tangents make equal angles with the co-ordinate axes ?

A. $\left(\frac{1}{2}, \frac{5}{24}\right)$ and $\left(-1, -\frac{1}{6}\right)$

B. $\left(\frac{1}{2}, \frac{4}{9}\right)$ and $(-1, 0)$

C. $\left(\frac{1}{3}, \frac{1}{7}\right)$ and $\left(-3, \frac{1}{2}\right)$

D. $\left(\frac{1}{3}, \frac{4}{47}\right)$ and $\left(-1, -\frac{1}{3}\right)$

Answer: A

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20. The equation of the normal to the parabola, $x^2 = 8y$ at $x = 4$ is

A. x+y=6

B. x+2y=0

C. 3-2y=0

D. x+y=2

Answer: A

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21. If $x = t^2$ and $y = 2t$ then equation of the normal at $t = 1$ is

A. x+y-3=0

B. x+y-1=0

C. x+y+1=0

D. x+y+3=0

Answer: A

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22. The equation of normal of

$x^2 + y^2 - 2x + 4y - 5 = 0$ at (2,1) is

A. y=3x-5

B. 2y=3x-4

C. y=3x+4

D. y=x+1

Answer: A

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23. The equation to the tangent to $\left(\frac{x}{a}\right)^n + \left(\frac{y}{b}\right)^n = 2$ at (a, b)

A. $\frac{x}{a} - \frac{y}{b}$

B. $\frac{x}{a} + \frac{y}{b} = 2$

C. $\frac{x}{a} = \frac{y}{b}$

D. $\frac{x}{a} + \frac{y}{b} = n$

Answer: B

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24. The equation of the tangent to the curve $x = 2\cos^3\theta$ and $y = 3\sin^3\theta$ at the point, $\theta = \pi/4$ is

A. $2x + 3y = 3\sqrt{2}$

B. $2x - 3y = 3\sqrt{2}$

C. $3x + 2y = 3\sqrt{2}$

D. $3x - 2y = 3\sqrt{2}$

Answer: C

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25. The distance between the origin and the normal to the curve $y = e^{2x} + x^2$ at $x = 0$ is

A. 2

B. $\frac{2}{\sqrt{3}}$

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

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

Answer: C

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26. IF the slope of the tangent to the circle $S = x^2 + y^2 - 13 = 0$ at (2,3) is m, then the point $\left(m, \frac{-1}{m}\right)$ is

A. an external point with respect to the circle S=0

B. an internal point with respect to the circle S=0

C. the centre of the circle S=0

D. a point on the circle S=0

Answer: B

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27. The normal to the curve $x = a(\cos\theta + \theta\sin\theta), y = a(\sin\theta - \theta\cos\theta)$ at any θ is such that

A. it makes a constant angle with X-axis

B. it passes through the origin

C. It is parallel to Y-axis

D. it is at a constant distance from the origin

Answer: D

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28. The normal to the curve $y = x^2 - x + 1$ drawn at the points with the abscissa $x_1 = 0, x_2 = -1$ and $x_3 = \frac{5}{2}$

A. are parallel to each other

B. are pair wise perpendicular

C. are concurrent

D. are not concurrent

Answer: C

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29. The normal to the curve $x^2 + 2xy - 3y^2 = 0,$ at (1,1)

A. does not meet the curve again

B. meets the curve again in the second quadrant

C. meets the curve again in the third quadrant

D. meets the curve again in the fourth quadrant

Answer: D

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30. The sum of the intercepts made on the axes of coordinates by any tangent to the curve $\sqrt{x} + \sqrt{y} = \sqrt{a}$ is equal to

A. a

B. 2a

C. $2\sqrt{a}$

D. None of these

Answer: A

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31. Let P be any point on the curve $x^{2/3} + y^{2/3} = a^{2/3}$. Then the length of the segment of the tangent between the coordinate axes in of length

A. 3a

B. 4a

C. 5a

D. a

Answer: D

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32. Angle between the tangents to the curve $y = x^2 - 5x + 6$ at the points (2,0) and (3,0) is

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

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

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

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

Answer: B

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33. The angle between the curves $y = \sin x$ and $y = \cos x, 0 < x < \frac{x}{2}$, is

A. $\tan^{-1}(2\sqrt{2})$

B. $\tan^{-1}(3\sqrt{2})$

C. $\tan^{-1}(3\sqrt{3})$

D. $\tan^{-1}(5\sqrt{2})$

Answer: A

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34. Let $y = e^{x^2}$ and $y = e^{x^2}$ sin x be two given curves . Then the angle between the tangents to the curves at any point of their intersection is

A. 0

B. π

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

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

Answer: A

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35. If the curves $y^2 = 6x, 9x^2 + by^2 = 16$ intersect each other at right angles then the value of b is: (1) 6 (2) $\frac{7}{2}$ (3) 4 (4) $\frac{9}{2}$

A. $\frac{7}{2}$

B. 4

C. $\frac{9}{2}$

D. 6

Answer: C

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36. A body moves according to the formula $v = l + t^2$, where V is the velocity at time t. The acceleration after 3sec will be (v in $cm / \sec$)

A. $24cm / \sec^2$

B. $12cm / \sec^2$

C. $6cm / \sec^2$

D. None of these

Answer: C

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37. A point moves in the straight line during the time t=0 to t=3 according to the law $s = 15t - 2t^2$. The average velocity is

A. 3 units

B. 9 units

C. 15 units

D. 27 units

Answer: B

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38. A particle moves in a straight line in such a way that its velocity at any point is given by $v^2 = 2 - 3x$, where x is measured from a fixed point. The acceleration is

A. Uniform

B. Zero

C. Non-uniform

D. Indeterminate

Answer: A

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39. Displacment x of a particle at time t is given by $x = At^2 + Bt + C$, where A,B,Care constants .If v is its velocity, then :$4Ax - v^2 =$

A. $4AC + B^2$

B. $4AC - B^2$

C. $2AC - B^2$

D. $2AC + B^2$

Answer: B

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40. IF $t = \frac{v^2}{2}$, then $\left(- \frac{df}{dt} \right)$ is equal to ,

(where f is acceleration)

A. f^2

B. f^3

C. $-f^3$

D. $-f^2$

Answer: B

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41. If the displacement velocity and acceleration of a particle at time t be x,v and f respectively, then which one is true?

A. $f = v^3 \frac{d^2t}{dx^2}$

B. $f = -v^3 \frac{d^2t}{dx^2}$

C. $f = v^2 \frac{d^2t}{dx^2}$

D. $f = -v^2 \frac{d^2 t}{dx^2}$

Answer: B

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42. If the law of motion in a straight line is $s = \frac{1}{2} vt$, then acceleration is

A. a constant

B. proportional to t

C. proportional to v

D. proportional to s

Answer: A

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43. The law of motion of a body moving along a straight line is $x = \frac{1}{2}vt$, x being its distance from a fixed point on the line at time t and v is its velocity there. Then

A. acceleration f varies directly with x

B. acceleration f varies inversely with x

C. acceleration f is constant

D. acceleration f varies directly with t

Answer: A

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44. A particle moves so that s=6+48t-t^3. The direction of motion reverses after moving a distance of

A. 63

B. 104

C. 134

D. 288

Answer: C

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45. The speed v of a particle moving along a straight line is given by $a+bv^2=x^2$, where x is its distance from the origin. The acceleration of the particle is

A. bx

B. x/a

C. x/b

D. x/ab

Answer: C

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46. A man of height 1.8 metre is moving away from a lamp post at the rate of $1.2m / \sec$. If the height of the lamp post be 4.5 metre, then the rate at which the shadow of the man is lengthening is

A. $0.4m / \sec$

B. $0.8m / \sec$

C. $1.2m / \sec$

D. None of these

Answer: B

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47. A 10cm long rod AB moves with its ends on two mutually perpendicular straight lines OX and OY . If the end A be moving at the rate of $2cm / \sec$, then when the distance of A from O is 8cm, the rate at which the end B is moving is

A. $\frac{8}{3}cm/\sec$

B. $\frac{4}{3}cm/\sec$

C. $\frac{2}{9}cm/\sec$

D. None of these

Answer: A

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48. A ladder 5 m in length is resting against vertical wall. The bottom of the ladder is pulled along the ground away from the wall at the rate of 1.5m/sec. The length of the highest point of the ladder when the foot of the ladder 4.0 m away from the wall decreases at the rate of

A. $2m/\sec$

B. $3m/\sec$

C. $2.5m/\sec$

D. $1.5m/\sec$

Answer: A

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49. A ladder 20 ft long leans against a vertical wall. The top end slides downwards at the rate of 2 ft per second. The rate at which the lower and moves on a horizontal floor when it is 12 ft from the wall is

A. $\frac{8}{3}$

B. $\frac{6}{5}$

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

D. $\frac{17}{4}$

Answer: A

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50. The rate of change of surface area of a sphere of radius r when the radius is increasing at the rate of 2 cm/sec is proportional to

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

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

C. r

D. r^2

Answer: C

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51. If by dropping a stone in a quiet lake a wave moves in circle at a speed of 3.5 cm/sec, then the rate of increase of the enclosed circular region when the radius of the circular wave is 10 cm, is $\left(\pi = \frac{22}{7}\right)$ $220 sq\dot{c}m / sec$ b. $110 sq\dot{c}m / sec$ c. $35 sq\dot{c}m / sec$ d. $350 sq\dot{c}m / sec$

A. $220 cm^2 / \sec$

B. $110cm^2/\sec$

C. $35cm^2/\sec$

D. $350cm^2/\sec$

Answer: A

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52. The sides of an equilateral triangle are increasing at the rate of 2 cm/sec. How far is the area increasing when the side is 10 cms?

A. $\sqrt{3}sq.\ unit/\sec$

B. $10sq.\ unit/\sec$

C. $10\sqrt{3}sq.\ unit/\sec$

D. $\frac{10}{\sqrt{3}}sq.\ unit/\sec$

Answer: C

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53. Given two squares of sides x and y such that $y = x + x^2$ what is the rate of change of area of the second square with respect to the area of the first square?

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

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

C. $2x^2 + 3x + 1$

D. 1+2x

Answer: C

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54. A container is in the shape of an inverted cone. Its height is 6 m and radius is 4 m at the top. IF it is filled with water at the rate of $3m^3 / \min$, then the rate of change of height of water (in$m / \min$) when the water level is 3 m is

A. $\frac{3}{4\pi}$

B. $\frac{2}{9\pi}$

C. 16π

D. 2π

Answer: A

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55. IF the volume of a spherical balloon is increasing at the rate of $900cm^3 / \sec$, then the rate of change of radisu of balloon at an instant when radius is 15cm [in$cm / \sec$] is

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

B. 22

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

D. None of these

Answer: C

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56. A spherical balloon is being inflated so that its volume increase uniformaly at the rate of $40cm^3/\text{minute}$. The rate of increase in its surface area when the radius is 8 cm, is

A. $\frac{5}{2}cm^2/\text{ min}$

B. $5cm^2/\text{ min}$

C. $10cm^2/\text{ min}$

D. $20cm^2/\text{ min}$

Answer: C

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57. If the volume of spherical ball is increasing at the rate of 4π cc/s, then the rate of change of its surface area when the volume is 288 π cc is

A. $\frac{4}{3}\pi cm^2/\sec$

B. $\frac{2}{3}\pi cm^2/\sec$

C. $4\pi cm^2/\sec$

D. $2x\pi cm^2/\sec$

Answer: A

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58. A spherical balloon is being inflated at the rate of 35 cc/min. The rate of increase of the surface area of the bolloon when its diameter is 14 cm is

A. $7cm^2/\text{ min}$

B. $10cm^2/\text{ min}$

C. $17.5cm^2 / \min$

D. $28cm^2 / \min$

Answer: B

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59. A spherical balloon is filled with 4500p cubic meters of helium gas. If a leak in the balloon causes the gas to escape at the rate of 72π cubic meters per minute, then the rate (in meters per minute) at which the radius of the balloon decreases 49 minutes after the leakage began is (1) $\frac{9}{7}$ (2) $\frac{7}{9}$ (3) $\frac{2}{9}$ (4) $\frac{9}{2}$

A. $\frac{9}{7}$

B. $\frac{7}{9}$

C. $\frac{2}{9}$

D. $\frac{9}{2}$

Answer: C

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60. The rate of change of volume of a sphere with respect to its surface area when the radius is 4 cm is

A. $4cm^3 / cm^2$

B. $2cm^3 / cm^2$

C. $6cm^3 / cm^2$

D. $8cm^3 / cm^2$

Answer: B

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61. The weight W of a certain stock of fish is given by W = nw, where n is the size of stock and w is the average weight of a fish. If n and w change with time t as n = $2t^2 + 3$ and $w = t^2 - t + 2$, then the rate of change of W with respect to t at t = 1, is

A. 1

B. 13

C. 5

D. 8

Answer: B

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62. The point on the curve $6y = x^3 + 2$ at which y- co ordinate is changing 8 times as fast as $x -$ co -ordinate is

A. (4,11)

B. (4,-11)

C. (-4,11)

D. (-4,-11)

Answer: A

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63. The approximate value of $f(X) = x^3 + 5x^2 - 7x + 9$ at x= 1.1 is

A. 8.6

B. 8.5

C. 8.4

D. 8.3

Answer: A

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64. The approximate value of $\sqrt[3]{-0.99}$ is _____.

A. -0.9967

B. -0.9976

C. -1.0033

D. -1

Answer: A

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65. What is approximate value of $\sqrt[5]{242.999}$?

A. $\frac{1214999}{4050}$

B. $\frac{1115}{405}$

C. $\frac{1214999}{405000}$

D. $\frac{121499}{40500}$

Answer: C

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66. The approximate value of $\cos 31^{\circ}$ is (Take $1^{\circ} = 0.0174$)

A. 0.7521

B. 0.866

C. 0.7146

D. 0.8573

Answer: D

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67. If the Rolle's theorem for $f(x) = e^{x}(\sin x - \cos x)$ is verified on $\left[\frac{\pi}{4}, \frac{5\pi}{4}\right]$ then the value of C is

A. $\pi / 3$

B. $\pi / 2$

C. $3\pi / 4$

D. π

Answer: D

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68. For the function $f(x) = e^{\cos x}$, Rolle's theorem is

A. Applicable when $\frac{\pi}{2} \leq x \leq \frac{3\pi}{2}$

B. Applicable when $0 \leq x \leq \frac{\pi}{2}$

C. Applicable when $0 \leq x \leq \pi$

D. Applicable when $\frac{\pi}{4} \leq x \leq \frac{\pi}{2}$

Answer: A

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69. In which of the following functions, Rolle's theorem is applicable?

A. $f(x) = |x| in - 2 \leq x \leq 2$

B. $f(x) = \tan x in 0 \leq x \leq \pi$

C. $f(x) = 1 + (x+2)^{\frac{2}{3}} in 1 \leq x \leq 3$

D. $f(x) = x(x-2)^2 in 0 \leq x \leq 2$

Answer: D

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70. For the function $f(x) = e^x, a = 0, b = 1$, the value of c in mean value theorem will be

A. logx

B. log(e-1)

C. 0

D. 1

Answer: B

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71. The value of c in mean value theorem for the function f(x)=x^2 in [2,4] is

A. 3

B. 2

C. 4

D. $\frac{7}{2}$

Answer: A

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72. In the Mean value theorem

$f(b) - f(a) = (b - a)f'(c)$, if a=4, b=9

and f(x)=$\sqrt{x}$, then the value of c is

A. 8.00

B. 5.25

C. 4.00

D. 6.25

Answer: D

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73. For the function $f(x) = (x-1)(x-2)$ defined on $\left[0, \frac{1}{2}\right]$, the value of 'c' satisfying Lagrange's mean value theorem is

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

B. $\frac{1}{5}$

C. $\frac{1}{7}$

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

Answer: D

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74. The constant 'c' of Lagrange's mean value theorem of the function $f(x) = \frac{2x+3}{4x-1}$ defined on [1,2] is

A. $\frac{1+\sqrt{15}}{3}$

B. $\frac{1+\sqrt{21}}{4}$

C. $\frac{5}{3}$

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

Answer: B

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75. If $f(x) = \cos x, 0 \leq x \leq \frac{\pi}{2}$ then the real number c of the mean value theorem is

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

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

C. $\sin^{-1}\left(\frac{2}{\pi}\right)$

D. $\cos^{-1}\left(\frac{2}{\pi}\right)$

Answer: C

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76. Let f(x) be continous on [0,6] and differentable on (0,6) Let f(0)=12 and f(6)=-4. If g(x) $= \frac{f(x)}{x+1}$ then for some Lagrange's constant c $\in$ (0,6),g'(c)=

A. $-\frac{44}{3}$

B. $-\frac{22}{21}$

C. $\frac{32}{21}$

D. $-\frac{44}{21}$

Answer: D

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77. In $[0, 1]$ Lagrange's mean value theorem is not applicable to

A. $f(x) = \begin{cases} \frac{1}{2} - x & x < \frac{1}{2} \\ \left(\frac{1}{2} - x\right)^2 & x \geq \frac{1}{2} \end{cases}$

B. $f(x) = \begin{cases} \frac{\sin x}{x} & x \neq 0 \\ 1 & x \neq 0 \end{cases}$

C. $f(x) = x|x|$

D. f(x)=$|x|$

Answer: A

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78. The abscisssa of the points of the curve $y = x^3$ in the interval [-2,2], where the slope of the tangents can be obtained by mean value theorem for the interval [-2,2] , are

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

B. $\pm \sqrt{3}$

C. $\pm\frac{\sqrt{3}}{2}$

D. 0

Answer: A

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79. If the function $f(x) = x^3 - 6ax^2 + 5x$ satisfies the conditions of Lagrange's mean theorem for the interval [1, 2] and the tangent to the curve $y = f(x)$ at $x = 7/4$ is parallel to the chord joining the points of intersection of the curve with the ordinates $x = 1$ and $x = 2$. Then the value of a is

A. $\frac{35}{16}$

B. $\frac{35}{48}$

C. $\frac{7}{16}$

D. $\frac{5}{16}$

Answer: B

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80. For all real values of x, increasing function f(x) is

A. x^{-1}

B. x^2

C. x^3

D. x^4

Answer: C

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81. The function f(x)=ax+b is strictly increasing for all real x is

A. $a > 0$

B. $a < 0$

C. a=0

D. $a \leq 0$

Answer: A

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82. For Which value of x, the function $f(x) = x^2 - 2x$ is decresing?

A. $x > 1$

B. $x > 2$

C. $x < 1$

D. $x < 2$

Answer: C

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

A. Always increases

B. Always decreases

C. Never decreases

D. Sometimes increases and sometimes decreases

Answer: A

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84. $f(x) = \begin{cases} 0 & x \leq 0 \\ x-3 & x > 0 \end{cases}$ The function f(x) is

A. Increasing when $x \geq 0$

B. Strictly increasing when $x > 0$

C. Strictly increasing at x=0

D. Not continous at x=0 and so it is not increasing when $x > 0$

Answer: B

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85. The function f(x)=cos x -2 px is monotonically decreasing for

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

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

C. $p < 2$

D. $p > 2$

Answer: B

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86. Function $f(x) = 2x^3 - 9x^2 + 12x + 29$ is monotonically decreasing when (a) $x < 2$ (b) $x > 2$ (c) $x > 3$ (d) `1

A. $x < 2$

B. $x > 2$

C. $x > 1$

D. $1 < x < 2$

Answer: D

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87. The function f(x)=$x^2 + 2x + 5$ is strictly increasing in the interval

A. $(-1, \infty)$

B. $(-\infty, -1)$

C. $[-1, \infty)$

D. $(-\infty, -1]$

Answer: A

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88. The function $f(x)=x^3-3x^2-24x+5$ is an increasing function in the interval

A. $(-\infty,-2)\cup(4,\infty)$

B. $(-2,\infty)$

C. $(-2,4)$

D. $(-\infty,4)$

Answer: A

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89. For which interval the given function $f(x)=2x^3-9x^2+12x+1$ is decreasing?

A. $(-2,\infty)$

B. $(-2,1)$

C. $(-\infty,-1)$

D. $(1, 2)$

Answer: D

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90. Where does $f(x) = x + \sqrt{1-x}, 0 < x < 1$ decrease?

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

B. $(0, 1)$

C. $\left(\frac{3}{4}, 1\right)$

D. $\left(0, \frac{3}{4}\right)$

Answer: C

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91. The function $f(x) = \sin^4 x + \cos^4 x \in creases$ if

A. $0 < x < \frac{\pi}{8}$

B. $\frac{\pi}{4} < x < \frac{3\pi}{8}$

C. $\frac{3\pi}{8} < x < \frac{5\pi}{8}$

D. $\frac{5\pi}{8} < x < \frac{3\pi}{4}$

Answer: B

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92. The values of a for which the function $(a+2)x^3 - 3x^2 + 9ax - 1$ decreases monotonically throughout for all real x are :-

A. $a < -2$

B. $a > -2$

C. $-3 < a < 0$

D. $-\infty < a \leq -3$

Answer: D

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93. If $f(x)=\dfrac{x}{x^2+1}$ is increasing function, then the value of x lies in

A. R

B. $(-\infty, -1)$

C. $(1, \infty)$

D. (-1,1)

Answer: D

Watch Video Solution

94. The function $f(x)=\dfrac{\log(1+x)_{2x}}{2+x}$ is increasing on

A. $(0, \infty)$

B. $(-\infty, 0)$

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

D. None of these

Answer: A

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95. The function f defined by $f(x) = (x+2)e^{-x}$ is

A. decreasing for all x

B. Decreasing in $(-\infty, 1)$ and increasing in $(-1, \infty)$

C. Increasing for all x

D. Decreasing in $(-1, \infty)$ and increasing in $(-\infty, -1)$

Answer: D

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96. A function is matched below against an interval where it is supposed to be increasing. Which of the following parts is incorrectly matched?

Interval, Function $[2, \infty)$, $2x^3 - 3x^2 - 12x + 6$ $(-\infty, \infty)$, $x^3 = 3x^2 + 3x + 3$ $(-\infty - 4)$, $x^3 + 6x^2 + 6$ $\left(-\infty, \frac{1}{3}\right)$, $3x^2 - 2x + 1$

A. $\left(-\infty, \frac{1}{3}\right) 3x^2 - 2x + 1$

B. $(-\infty, -4) x^2 + 6x^2 + 6$

C. $(-\infty, \infty) x^3 - 3x^2 + 3x + 3$

D. $[2, \infty)\ 2x^3 - 3x^2 - 12x + 6$

Answer: A

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97. The function $f(x) = \frac{\ln(\pi + x)}{\ln(e + x)}$ is increasing in $(0, \infty)$ decreasing in $(0, \infty)$ increasing in $\left(0, \frac{\pi}{e}\right)$, decreasing in $\left(\frac{\pi}{e}, \infty\right)$ decreasing in $\left(0, \frac{\pi}{e}\right)$, increasing in $\left(\frac{\pi}{e}, \infty\right)$

A. Increasing on $[0, \infty)$

B. Decreasing on $[0, \infty)$

C. Decreasing on $\left[0, \frac{\pi}{e}\right)$ and increasing on $\left[\frac{\pi}{e}, \infty\right)$

D. Increasing on $\left[0, \frac{\pi}{e}\right)$ and decreasing on $\left[\frac{\pi}{e}, \infty\right)$

Answer: B

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98. If $f(x) = x^3 - 10x^2 + 200x - 10$, then $f(x)$ is

A. f(x) is decreasing in $(-\infty, 10]$ and increasing in $[10, \infty)$

B. f(x) is increasing in $(-\infty, 10]$ and decreasing in $[10, \infty)$

C. f(x) is increasing throughout real line

D. f(x) is decreasing throughout real line

Answer: C

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99. If $f(x) = x^{\frac{3}{2}}(3x - 10), x \geq 0,$ then $f(x)$ is increasing in ____.

A. $(-\infty, -1) \cup (1, \infty)$

B. $[2, \infty)$

C. $(-\infty, -1) \cup [2, \infty)$

D. $(-\infty, 0] \cup (2, \infty)$

Answer: B

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100. The function $f(x) = \tan^{-1}(\sin x + \cos x)$ is an increasing function in

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

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

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

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

Answer: B

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101. Let f(x) = log (sin x+ cos x), x in x $\left(-\frac{\pi}{4}, \frac{3\pi}{4}\right)$. Then f is stricly increasing in the interval

A. $\left(-\frac{\pi}{4}, \frac{\pi}{4}\right)$

B. $\left(0, \frac{3\pi}{8}\right)$

C. $\left(-\frac{\pi}{4}, \frac{\pi}{2}\right)$

D. $\left(\frac{\pi}{2}, \frac{3\pi}{4}\right)$

Answer: A

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102. Let $f(x) = \int e^x (x-1)(x-2) dx$. Then f decreases in the interval $(-\infty, -2)$ (b) $-2, -1)$ $(1, 2)$ (d) $(2, +\infty)$

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

B. $(-2, -1)$

C. $(1, 2)$

D. $(2, \infty)$

Answer: C

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103. $f(x) = \dfrac{x}{\sin x}$ and $g(x) = \dfrac{x}{\tan x}$, where $0 < x \leq 1$ then in the interval

A. both f(x) and g(x) are increasing function

B. both f(x) and g(x) are decreasing function

C. f(x) is an increasing function

D. g(x) is an increasing function

Answer: C

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104. If $f(x) = \sin x - \cos x$, the function decreasing in $0 \leq x \leq 2\pi$ is

A. $\left[\frac{5\pi}{6}, \frac{3\pi}{4}\right]$

B. $\left[\frac{\pi}{4}, \frac{\pi}{2}\right]$

C. $\left[\frac{3\pi}{2}, \frac{5\pi}{2}\right]$

D. None of these

Answer: D

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105. Let $h(x) = f(x) - (f(x))^2 + (f(x))^3$ for every real x. Then,

A. h is increasing whenever f is increasing

B. h is increasing whenever f is decreasing

C. h is decreasing whenever f is increasing

D. nothing can be said in general

Answer: A

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106. The function f(x)=$[x(x-2)]^2$ is increasing in the set

A. $(-\infty, 0) \cup (2, \infty)$

B. $(-\infty, 1)$

C. $(0, 1) \cup (2, \infty)$

D. $(1, 2)$

Answer: C

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107. $y = x(x-3)^2$ increases for all values of x lying in the interval

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

B. $0 < x < \infty$

C. $-\infty < x < 0$

D. $1 < x < 3$

Answer: A

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108. The minimum value of

$f(a) = \left(2a^2 - 3\right) + 3(3-a) + 4$ is

A. $\frac{15}{2}$

B. $\frac{11}{2}$

C. $\frac{-13}{2}$

D. $\frac{71}{8}$

Answer: D

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109. 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

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110. The function $x^5 - 5x^4 + 5x^3 - 10$ has a maxima, when $x =$

A. 3

B. 2

C. 1

D. 0

Answer: C

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111. If for a function $f(x)$, $f'(a) = 0$, $f(a) = 0$, $f'''(a) > 0$, then at $x = a$, $f(x)$ is

A. Minimum

B. Maximum

C. Not an extreme point

D. Extreme point

Answer: C

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112. The local maximum of $y = x^3 - 3x^2 + 5$ is attained at

A. x=0

B. x=2

C. x=1

D. x=-1

Answer: A

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113. The function $f(x) = 2x^3 - 15x^2 + 36x + 4$ is maximum at

A. 0

B. 3

C. 4

D. 2

Answer: D

Watch Video Solution

114. Let $f(x) = 2x^3 - 3x^2 - 12x + 5$ on $[-2, 4]$. The relative maximum occurs at $x =$

A. 2

B. -1

C. -2

D. 4

Answer: D

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115. Maximum value of $x(1-x)^2$ when $0 \leq x \leq 2$ is

A. $\frac{2}{27}$

B. $\frac{4}{27}$

C. 5

D. 0

Answer: B

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116. The minimum value of $\left(x^2 + \frac{250}{x}\right)$ is

A. 75

B. 50

C. 25

D. 55

Answer: A

Watch Video Solution

117. The minimum value of the function $f(x) = x \log x$ is

A. $-\frac{1}{e}$

B. $-e$

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

D. e

Answer: A

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

A. e

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

C. e^2

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

Answer: B

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119. If x and y are two positive numbers such that x+y=32, then the maximum value of $x^2 + y^2$ is ,

A. 500

B. 256

C. 1024

D. 512

Answer: D

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120. In the interval $[0, 1]$, the function $x^{25}(1-x)^{75}$ takes its maximum value at the point 0 (b) $\frac{1}{4}$ (c) $\frac{1}{2}$ (d) $\frac{1}{3}$

A. 0

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

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

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

Answer: D

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121. Let $f(x)=x^2+\left(\frac{1}{x^2}\right)$ and $g(x)=x-\frac{1}{x}\ \xi nR-\{-1, 0, 1\}$. If $h(x)=\left(\frac{f(x)}{g(x)}\right)$ then the local minimum value of $h(x)$ is: (1) 3 (2) -3 (3) $-2\sqrt{2}$ (4) $2\sqrt{2}$

A. -3

B. $-2\sqrt{2}$

C. $2\sqrt{2}$

D. 3

Answer: C

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122. If the function $f(x)=2x^3-9ax^2+12x^2x+1, wherea>0,$ attains its maximum and minimum at $pandq$, respectively, such that $p^2=q,$ then a equal to 1 (b) 2 (c) $\frac{1}{2}$ (d) 3

A. 1

B. 3

C. 2

D. $\sqrt{2}$

Answer: D

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123. If minimum value of $f(x) = (x^2 + 2bx + 2c^2)$ is greater than the maximum value of $g(x) = -x^2 - 2cx + b^2$, then $(x \in R)$

A. $c^2 > 2b^2$

B. $c^2 < 2b^2$

C. $b^2 = 2c^2$

D. $c^2 = 2b^2$

Answer: A

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124. Let $f_n(x)$ be the n^{th} derivative of f(x).the least value of n so that $f_n = f_{n+1}$ where $f(x) = x^2 + e^x$ is

A. 4

B. 5

C. 2

D. 3

Answer: D

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125. If from a wire of length 36 metre a rectangle of greatest area is made, than its two adjacent sides in metre are

A. 6,12

B. 9,9

C. 10,8

D. 13,5

Answer: B

Watch Video Solution

126. Twenty metres of wire is available for fencing off a flower-bed in the form of a circular sector. Then the maximum area (in $s\dot{q}m$) of the flower-bed is: 25 (2) 30 (3) 12.5 (4) 10

A. 30

B. 12.5

C. 10

D. 25

Answer: D

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127. The sum of two non-zero numbers is 4. The minimum value of the sum of their reciprocals is

A. $\frac{3}{4}$

B. $\frac{6}{5}$

C. 1

D. None of these

Answer: C

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128. The area of a rectangle will be maximum for the given perimeter, when rectangle is a

A. Parallelogram

B. Trapezium

C. Square

D. None of these

Answer: C

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129. A population p(t) of 1000 bacteria introduced intonutrient medium grows according to the relation $p(t) = 1000 + 1000\frac{t}{100 + t^2}$. The maximum size of the this bacterial population is

A. 1100

B. 1250

C. 1050

D. 5250

Answer: D

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130. The least value of the sum of any positive real number and its reciprocal is

A. 1

B. 2

C. 3

D. 4

Answer: B

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131. The function f(x)=x+sinx has

A. a maximum but no maximum

B. a maximum but no minimum

C. neither maximum nor minimum

D. both maximum and minimum

Answer: C

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132. 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. 1

C. 3

D. 0

Answer: B

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133. If $f(x) = \dfrac{x^2 - 1}{x^2 + 1}$. For every real number x, then the minimum value of $f \cdot$ does not exist because f is unbounded is not attained even through f is bounded is equal to 1 is equal to -1

A. does not exist because f is unbounded

B. is not attained even through f is bounded

C. is equal to 1

D. is equal to -1

Answer: D

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134. If G and L are the greatest and least values of the expression $\frac{x^2-x+1}{x^2+x+1}, x\varepsilon R$ respectively then

The least value of G^(5)+L^(5)` is

A. $3, \; -\frac{1}{2}$

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

C. $-3, \; -\frac{1}{3}$

D. None of these

Answer: B

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135. The maximum value of

$\exp\left(2+\sqrt{3}\cos x+\sin x\right)$ is

A. exp(2)

B. $\exp\left(2-\sqrt{3}\right)$

C. exp(4)

D. 1

Answer: C

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136. The function 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

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

A. e

B. e^{e}

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

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

Answer: C

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138. The height of the cylinder of the greatest volume that can be inscribed in a sphere of radius 3 is

A. $3\sqrt{3}$

B. $2\sqrt{3}$

C. $\sqrt{3}$

D. $\sqrt{2}$

Answer: B

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139. The radius of the cylinder of maximum volume, which can be inscribed in a sphere of radius R is

A. $\frac{2}{3}R$

B. $\sqrt{\frac{2}{3}}R$

C. $\frac{3}{4}R$

D. $\sqrt{\frac{3}{4}}R$

Answer: B

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140. If a cone of maximum volume is inscribed in a given sphere, then the ratio of the height of the cone to the diameter of the sphere is $3/4$ (b) $1/3$ (c) $1/4$ (d) $2/3$

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

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

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

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

Answer: A

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141. Area of the greatest rectangle that can be inscribed in the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is

A. $\sqrt{ab}$

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

C. 2ab

D. ab

Answer: C

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142. 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 cubis has minimum at $\sqrt{\frac{p}{3}}$ and $-\sqrt{\frac{p}{3}}$

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

Answer: C

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143. 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

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144. Let $f: R\overrightarrow{R}$ be defined by $f(x) = \{k - 2x, \quad \text{if} \quad x \leq \ - 12x + 3, fx \succ 1\}$. If f has a local minimum at $x = 1$, then a possible value of k is (1) 0 (2) $-\frac{1}{2}$ (3) -1 (4) 1

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

B. -1

C. 1

D. 0

Answer: B

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145. For $x\varepsilon\left(0, \frac{5\pi}{2}\right)$, definite $f(x) = \int_0^x \sqrt{t}\sin t dt$. Then f has

A. local maximum at π and 1π

B. local minimum at π and 2π

C. local minimum at π and maximum at 2π

D. local maximum at π and minimum at 2π

Answer: D

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146. Let $IR\overrightarrow{I}R$ be defined as $f(x) = |x| + \; + x^2 - 1 \mid \cdot$ 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

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147. If $f(x) = \begin{cases} x, & 0 \le x \le 1 \\ 2 - e^{x-1}, & 1 < x \le 2 \\ x - e, & 2 < x \le 3 \end{cases}$ and $g'(x) = f(x), x \in [1, 3]$,

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 g(x) have same points of local maxima and local minima

D. None of these

Answer: C

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148. 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

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

A. [0,1]

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

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

D. $(0, 1]$

Answer: D

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150. 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) is the maximum of P

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

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

D. Neither P(-1) is the maximum nor P(1) is the maximum of P

Answer: B

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151. 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

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152. The points on the curve $y = 12x - x^3$ at which the gradient is zero are

A. (0,12),(2,16)

B. (0,-2),(2,-16)

C. (2,-16),(-2,16)

D. (2,16),(-2,-16)

Answer: D

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153. The displacement of a particle at time t is x, where $x = t^4 - kt^3$. IF the velocity of the particle at time t=2 is minimum, then

A. k=4

B. k=-4

C. k=8

D. k=-8

Answer: A

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154. If f(x) satifies of conditiohns of Rolle's theorem in [1,2] and f(x) is continuous in [1,2] then $\therefore \int_1^2 f'(x)dx$ is equal to

A. 3

B. 0

C. 1

D. 2

Answer: B

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155. IF $f(x) = x, \ -1 \leq x \leq 1$, then function f(x) is

A. Increasing

B. Decreasing

C. Stationary

D. Discontinous

Answer: A

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156. If $f(x) = x^3 + bx^2 + cx + d$ and `0

A. is bounded

B. has a local maxima

C. has a local minima

D. is strictly increasing

Answer: D

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157. 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 $p(1) = 6andp(3) = 2,$ then $p'(0)$ is____

A. 8

B. 9

C. 3

D. 6

Answer: B

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158. Let f(x) be a polynomial of degree four having extreme values 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. -8

B. -4

C. 0

D. 4

Answer: C

Watch Video Solution

159. if

$A > 0, B > 0$ and $A + B = \frac{\pi}{3} thenthe \max i\mu mvalueof \tan A. \tan Bis($

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

A. $\frac{1}{\sqrt{3}}$

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

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

D. $\sqrt{3}$

Answer: B

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160. A wire of length 2 units is cut into two parts which are bent respectively to form a square of $side = x$ units and a circle of $radius = r$ units. If the sum of the areas of the square and the circle so formed is minimum, then : (1) $2x = (\pi + 4)r$ (2) $(\pi + 4)x = \pi r$ (3) $x = 2r$ (4) $2x = r$

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

B. $x = 2r$

C. $2x = r$

D. $2x = (\pi + 4)r$

Answer: B

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161. Consider $f(x) = \tan^{-1}\left(\sqrt{\frac{1+\sin x}{1-\sin x}}\right), x \in \left(0, \frac{\pi}{2}\right)$. A normal to $y = f(x)$ at $x = \frac{\pi}{6}$ also passes through the point: (1) (0, 0) (2) $\left(0, \frac{2\pi}{3}\right)$ (3) $\left(\frac{\pi}{6}, 0\right)$ (4) $\left(\frac{\pi}{4}, 0\right)$

A. $\left(0, \frac{2\pi}{3}\right)$

B. $\left(\frac{\pi}{6}, 0\right)$

C. $\left(\frac{\pi}{4}, 0\right)$

D. (0,0)

Answer: A

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Evaluation Test

1. If $27a + 9b + 3c + d = 0$ then the equation $4ax^3 - 3bx^2 + 2cx + 0$ has at leat one real root laying between

A. 0 and 1

B. 1 and 3

C. 0 and 3

D. None of these

Answer: C

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2. If the curve $y = x^2 + bx + c$ touches the line y = x at the point (1,1), then the set of values of x for which the curve has a negative gradient is

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

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

C. $x < -\frac{1}{2}$

D. $x > -\frac{1}{2}$

Answer: A

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3. A tangent to the parabola $y^2 = 8x$ makes an angle of 45^0 with the straight line $y = 3x + 5$. Then find one of the points of contact.

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

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

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

D. None of these

Answer: C

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4. The greatest value of the function $f(x) = \tan^{-1} x - \frac{1}{2}\log x$ in $\left[\frac{1}{\sqrt{3}}, \sqrt{3}\right]$ is

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

B. $\frac{\pi}{6} - \frac{1}{4}\log 3$

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

D. $\frac{\pi}{3} - \frac{1}{2}\log 3$

Answer: A

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5. IF $\alpha + \beta = \frac{\pi}{2}$, then cos$\alpha$ cos β has a maximum value at β=

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

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

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

D. None of these

Answer: A

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6. Prove that the segment of the tangent to the hyperbola $y = \frac{c}{x}$ which is contained between the coordinate axes is bisected at the point of tangency.

A. $1:1$

B. $1:2$

C. $1:3$

D. None of these

Answer: A

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7. If $2a + 3b + 6c = 0,$ then prove that at least one root of the equation $ax^2 + bx + c = 0$ lies in the interval (0,1).

A. (0,1)

B. (1,2)

C. (2,3)

D. (1,3)

Answer: A

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8. The maximum value of $f(x) = \sin x(1 + \cos x)$ is

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

B. $\frac{3\sqrt{3}}{2}$

C. $3\sqrt{3}$

D. $\sqrt{3}$

Answer: A

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9. The minimum value of $f(x) = \sin^4 x + \cos^4 x, 0 \leq x \leq \frac{\pi}{2}$ is

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

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

C. $-\frac{1}{2}$

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

Answer: D

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

A. 1

B. 2

C. 2^{27}

D. None of these

Answer: A

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11. If the function f(x)=3 cos |x| -6 ax +b increases for all $x \in R$ then the range of value of a given by

A. $a > -\frac{1}{2}$

B. $a < -\frac{1}{2}$

C. $a \leq b$

D. $a \geq b$

Answer: B

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12. The minimum value of $a^2 \sec^2 x + b^2 \cos ec^2 x, 0 < a < b$,is

A. a+b

B. $(a+b)^2$

C. $(a+b)^4$

D. None of these

Answer: B

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13. The function y=$\frac{ax+b}{x-1}(x-4)$ has turning point at P(2,-1) Then find the values of a and b.

A. a=0,b=1

B. a=0,b=-1

C. a=1,b=0

D. a=-1,b=0

Answer: C

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14. if $0 < \alpha < \beta < \frac{\pi}{2}$, then

A. $\frac{\tan\alpha}{\tan\beta} < \frac{\alpha}{\beta}$

B. $\frac{\tan\beta}{\tan\alpha} > \frac{\alpha}{\beta}$

C. $\frac{\tan\alpha}{\tan\beta} > \frac{\alpha}{\beta}$

D. $\frac{\tan \alpha}{\tan \beta} > \frac{\alpha}{\beta}$

Answer: B

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15. The two curves $y = 3^x$ and $y = 5^x$ intersect at an angle

A. $\tan^{-1}\left(\frac{\log 3 - \log 5}{1 + \log 3. \log 5}\right)$

B. $\tan^{-1}\left(\frac{\log 3 + \log 5}{1 - \log 3. \log 5}\right)$

C. $\tan^{-1}\left(\frac{\log 3 + \log 5}{1 + \log 3 \log 5}\right)$

D. None of these

Answer: A

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16. If α and β $(\alpha < \beta)$ are two different real rootsof the equation $ax^2 + bx + c = 0$, then

A. $\alpha > -\frac{b}{2a}$

B. $\beta < -\frac{b}{2a}$

C. $\alpha < -\frac{b}{2a} < \beta$

D. None of these

Answer: C

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17. The function $f(x) = \tan^{-1}(\sin x + \cos x)$ is an increasing function in

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

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

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

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

Answer: B

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18. If the function

$f(x) = x^3 - 12ax^2 + 36a^2x - 4(a > 0)$ attains its maximum and minimum at x=p and x=q respectively, and if $3p = q^2$, then a is equal to

A. $\frac{1}{6}$

B. $\frac{1}{36}$

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

D. 18

Answer: A

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19. Verify Rolle's theorem for each of the following functions :

$$f(x) = e^{-x}(\sin x - \cos x) \text{ in } \left[\frac{\pi}{4}, \frac{5\pi}{4}\right]$$

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

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

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

D. None of these

Answer: A

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20. The abscissa of the point on the curve $ay^2 = x^3$, the normal at which cuts off equal intercepts from the coordinate axes is

A. $\left(\frac{4a}{9}, \frac{8a}{27}\right)$

B. $\left(\frac{a}{9}, \frac{a}{27}\right)$

C. $\left(\frac{4a}{9}, \frac{-8a}{27}\right)$

D. $\left(\frac{a}{9} - \frac{a}{27}\right)$

Answer: A

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