MATHS

BOOKS - NIKITA MATHS (HINGLISH)

APPLICATIONS OF DERIVATIVES

Multiple Choice Questions

1. The equation of tangent to the curve $y = 3x^2 - x + 1$ at (1,3) is

A. $y = 5x + 2$

B. $y = 5x - 2$

C. $y = \frac{x}{5} + 2$

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

Answer: B

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2. The equation of tangent to the curve $y = x^2 + 4x + 1$ at (-1,-2) is

A. 2x-y=0

B. 2x+y-5=0

C. 2x-y-1=0

D. x+y-1=0

Answer: A

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3. The equation of tangent to the curve $2x^2 + 3y^2 - 5 = 0$ at (1,1) is

A. 2x+3y+5=0

B. 2x-3y-5=0

C. 2x-3y+5=0

D. 2x+3y-5=0

Answer: D

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4. The equation of tangent to the curve $\sqrt{x} - \sqrt{y} = 1$ at (9,4) is

A. 2x+3y=6

B. 2x+3y+6=0

C. 2x-3y+6=0

D. 2x-3y=6

Answer: D

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5. The equation of tangent to the curve $x^2 + y^2 + xy = 3$ at (1,1) is

A. x+y-2=0

B. x-y+2=0

C. x-y-2=0

D. x+y+2=0

Answer: A

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6. The equation of tangent to the curve $xy = c^2$ at $\left(ct, \frac{c}{t}\right)$ is

A. $x - t^2 y = 2ct$

B. $x - ty = 2ct$

C. $x + t^2 y = 2ct$

D. $x + ty = 2ct$

Answer: C

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7. The equation of tangent to the curve $y = \sqrt{2}\sin\left(2x + \frac{\pi}{4}\right)$ at $x = \frac{\pi}{4}$ is

A. $2x - y - \frac{\pi}{2} - 1 = 0$

B. $2x + y - \frac{\pi}{2} - 1 = 0$

C. $2x + y + \frac{\pi}{2} + 1 = 0$

D. $2x - y + \frac{\pi}{2} + 1 = 0$

Answer: B

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8. The equation of tangent to the curve $y = 4xe^{x}$ at $\left(-1, \frac{-4}{e}\right)$ is

A. x=0

B. y=0

C. $x = \frac{-4}{e}$

D. $y = \frac{-4}{e}$

Answer: D

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

A. 5x+y+4=0

B. 5x-y-4=0

C. 5x+y-4=0

D. 5x-y+4=0

Answer: C

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10. The equation of tangent to the curve $x = \sin\theta$ and $y = \cos 2\theta$ at $\theta = \frac{\pi}{6}$ is

A. 4x+2y+3=0

B. 4x-2y+3=0

C. 4x+2y-3=

D. 4x-2y-3=0

Answer: C

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

A. 2x-y=3a

B. 2x+y=3a

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

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

Answer: C

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12. The equation of tangent to the curve $x = a(\theta + \sin \theta), y = a(1 + \cos \theta)$ at $\theta = \frac{\pi}{2}$ is

A. $2x - 2y = a(\pi + 2)$

B. $2x + 2y = a(\pi + 2)$

C. $2x - 2y = a(\pi + 4)$

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

Answer: D

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13. The equation of tangent to the curve $x = a\cos^3\theta, y = a\sin^3\theta$ at $\theta = \frac{\pi}{4}$ is

A. $\sqrt{2}x + \sqrt{2}y + a = 0$

B. $\sqrt{2}x - \sqrt{2}y - a = 0$

C. $\sqrt{2}x - \sqrt{2}y + a = 0$

D. $\sqrt{2}x + \sqrt{2}y - a = 0$

Answer: D

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14. The angle made by the tangent to the curve $x = a(\theta + \sin\theta\cos\theta), y = a(1 + \sin\theta)^2$ wutg X-axis is

A. $\frac{\pi}{4} + \frac{\theta}{2}$

B. $\frac{\pi}{4} - \frac{\theta}{2}$

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

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

Answer: A

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15. The equation of tangent to the curve $y = x^3 - x^2 - 1$ at the point whose absicissa is -2 is

A. 16x-y+19=0

B. 16x-y=19

C. 16x+y+19=0

D. 16x+y=19

Answer: A

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16. The equation of tangent to the curve $y = x^2 + 4x$ at the points whose ordinate is -3 are

A. 2x+y-1=0, 2x+y-9=0

B. 2x+y-1=0, 2x+y+9=0

C. 2x-y-1=0, 2x+y+9=0

D. 2x-y-1=0, 2x+y-9=0

Answer: C

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17. The equation of tangent to the curve $y = 6 - x^2$, where the normal is parallel to the line $x - 4y + 3 = 0$ is

A. 4x-y+10=0

B. 4x+y-10=0

C. 4x-y-10=0

D. 4x+y+10=0

Answer: B

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18. The equation of tangent to the curve $x^2 + y^2 = 5$, where the tangent is parallel to the line 2x-y+1=0 are

A. 2x-y+5=0, 2x-y-5=0

B. 2x+y+5=0, 2x+y-5=0

C. x-2y+5=0, x-2y-5=0

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

Answer: A

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19. If the line x+y=0 touches the curve $2y^2 = ax^2 + b$ at (1,-1), then

A. a=2, b=0

B. a=-2, b=4

C. a=0, b=2

D. a=4, b=-2

Answer: A

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20. If the line y=4x-5 touches the curve $y^2 = ax^3 + b$ at the point (2,3), then 7a+2b=0

A. 1

B. 2

C. 0

D. 3

Answer: C

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21. If the tangent to the curve $y^2 = ax^2 + b$ at the point (2,3) is y=4x-5, then (a,b)=

A. (6-15)

B. (-6,15)

C. (-6,-15)

D. (6,15)

Answer: A

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22. The co-ordinates of the point of the curve $y = x - \frac{4}{x}$, where the tangent is parallel to the line y=2x is

A. (2,2)

B. (-2,-2)

C. $(\pm 2, 0)$

D. (0,2)

Answer: C

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23. The points on the curve $y = x^3 - 2x^2 - x$, where the tangents are parallel to 3x-y+1=0 are

A. $(2, -2), \left(\frac{2}{3}, \frac{-14}{27}\right)$

B. $(2, -2), \left(\frac{-2}{3}, \frac{-14}{27}\right)$

C. $(-2, 2), \left(\frac{2}{3}, \frac{-14}{27}\right)$

D. $(-2, 2), \left(\frac{-2}{3}, \frac{-14}{27}\right)$

Answer: B

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24. The points on the curve $y = \sqrt{x - 3}$, where the tangent is perpendicular to the line 6x+3y-5=0 are

A. $(4, \pm 1)$

B. $(4, \pm 2)$

C. $(5, \sqrt{2})$

D. (7,2)

Answer: A

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25. At origin, the curve $y = \sqrt{x}$ has

A. no tangent

B. oblique tangent

C. a vertical tangent

D. a horizontal tangent

Answer: C

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26. If the curve $ax^2 + by^2 = 1$ and $a'x^2 + b'y^2 = 1$ intersect orthogonally, then

A. a+b=a'+b'

B. a-b=a'-b'

C. $\frac{1}{a}+\frac{1}{b}=\frac{1}{a'}+\frac{1}{b'}$

D. $\frac{1}{a}-\frac{1}{b}=\frac{1}{a'}-\frac{1}{b'}$

Answer: D

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27. For the curve $x=a\cos^3\theta, y=a\sin^3\theta,$ the sum of the squares of the intercepts made by any tangent on the co-ordinate axes is

A. a^2

B. a

C. $-a^2$

D. $-a$

Answer: A

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28. The equation of normal to the curve $y=3x^2+4x-5$ at $(1, 2)$ is

A. x+10y-21=0

B. x-10y+21=0

C. x-10y-21=0

D. x+10y+21=0

Answer: A

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

A. x+5y+16=0

B. x+5y-16=

C. x-5y+16=0

D. x-5y-16=0

Answer: B

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30. The equation of normal to the curve $y = x^2 + 4x + 1$ at (-1,-2) is

A. x-2y+5=0

B. x+2y-5=0

C. x+2y+5=0

D. x-2y-5=0

Answer: C

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31. The equation of normal to the curve $2x^2 + 3y^2 - 5 = 0$ at (1,1) is

A. 3x-2y-1=0

B. 3x-2y+1=0

C. 3x+2y-1=0

D. 3x+2y+1=0

Answer: A

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32. The equation of normal to the curve $\sqrt{x} - \sqrt{y} = 1$ at (9,4) is

A. 3x-2y+35=0

B. 3x+2y-35=0

C. 3x-2y-35=0

D. 3x+2y+35=0

Answer: B

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33. The equation of normal to the curve $x^2 + y^2 + xy = 3$ at P(1,1) is

A. x+y=0

B. x-y=0

C. x+y=2

D. x-y=2

Answer: B

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34. The equation of normal to the curve $x^2 + y^2 - 3x - y + 2 = 0$ at P(1,1) is

A. x+y+2=0

B. x-y+2=0

C. x+y-2=0

D. x-y-2=0

Answer: C

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35. The equation of normal to the curve $xy = c^3$ at $\left(ct, \frac{c}{t}\right)$ is

A. $t^3x + ty + c(t^4 - 1) = 0$

B. $t^3x - ty - c(t^4 - 1) = 0$

C. $t^3x - ty + c(t^4 - 1) = 0$

D. $t^3x + ty - c(t^4 - 1) = 0$

Answer: B

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36. The equation of normal to the curve $y = \sqrt{2}\sin\left(2x + \frac{\pi}{4}\right)$ at $x = \frac{\pi}{4}$ is

A. $x + 2y + 2 - \frac{\pi}{4} = 0$

B. $x + 2y - 2 + \frac{\pi}{4} = 0$

C. $x - 2y + 2 - \frac{\pi}{4} = 0$

D. $x - 2y - 2 + \frac{\pi}{4} = 0$

Answer: C

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37. 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. x+5y-7=0

C. x-5y+7=0

D. x-5y-7=0

Answer: C

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38. The equation of normal to the curve $x = \sin\theta$ and $y = \cos 2\theta$ at $\theta = \frac{\pi}{6}$ is

A. 2x+4y+1=0

B. 2x-4y-1=0

C. 2x+4y-1=0

D. 2x-4y+1=0

Answer: D

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

A. $\sqrt{3}x + 2\sqrt{3}y + 4a = 0$

B. $\sqrt{3}x - 2\sqrt{3}y - 4a = 0$

C. $\sqrt{3}x - 2\sqrt{3}y + 4a = 0$

D. $\sqrt{3}x + 2\sqrt{3}y - 4a = 0$

Answer: D

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40. The equation of normal to the curve $x = a\cos^3\theta, y = a\sin^3\theta$ at $\theta = \frac{\pi}{4}$ is

A. x-y=0

B. x+y=0

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

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

Answer: A

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41. The equation of normal to the curve $y = x^3 - x^2 - 1$ at the point whose abscissa is -2, is

A. x+16y+206=0

B. x+16y-206=0

C. x+16y+210=0

D. x+16y-210=0

Answer: C

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42. The equation of normal to the curve $y = x^2 + 4x$ at the point whose ordinate is -3, is

A. x-2y-5=0, x+2y+9=0

B. x+2y+5=0, x-2y-9=0

C. x-2y-7=0, x+2y+3=0

D. x+2y+7=0, x-2y-3=0

Answer: D

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43. The equation of normal to the curve $y = 6 - x^2$, where the normal is parallel to the line $x - 4y + 3 = 0$

is

A. x-4y-6=0

B. x+4y-6=0

C. x-4y+6=0

D. x+4y+6=0

Answer: C

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44. The equation of normal to the curve $x^2 + y^2 = 5$, where the tangent is parallel to the line 2x-y+1=0 is

A. 2x-y=0

B. 2x+y=0

C. x-2y=0

D. x+2y=0

Answer: D

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45. The equation of the normal to the curve $y = \sqrt{x-3}$, which is parallel to the curve $6x + 3y - 4 = 0$ are

A. 2x+y+9=0, 2x+y+7=0

B. 2x-y+9=0, 2x+y+7=0

C. 2x+y-9=0, 2x+y-7=0

D. 2x-y-9=0, 2x+y-7=0

Answer: C

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46. If the inclination of the normal to the curve y=f(x) at the point (5,6) makes an anlge of $\frac{2\pi}{3}$, then f'(5)=

A. $\sqrt{3}$

B. $-\sqrt{3}$

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

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

Answer: D

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47. 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 is at constant distance from the origin

C. It passes through the origin

D. It makes a constant angle with Y-axis

Answer: B

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

A. meets the curve again the third quadrant

B. meets the curve again in the fourth quadrant

C. does not meet the curve again

D. meets the curve again in the second quadrant

Answer: B

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49. 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. (0,0)

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

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

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

Answer: B

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50. If normal the curve y=f(x) is parallel to X-axis, then correct statement is

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

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

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

D. $\frac{dx}{dy} \neq 0$

Answer: A

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51. A particle is moving in such a way that its displacement s at the t is given by $s = 2t^2 + 5t + 20$. After 2 seconds its velocity is

A. 13 units/sec

B. 4 unit/sec

C. 3 units/sec

D. 8 units/sec

Answer: A

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52. A particle is moving in such a way that its displacement s at time t is given by $s = 2t^2 + 5t + 20$. After 2 second its acceleration is

A. 13 units/sec^2

B. 4 units/sec^2

C. $3 \quad \text{units/sec}^2$

D. $8 \quad \text{units/sec}^2$

Answer: B

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53. If the displacement of a moving particle is given by $s = 5 + 20t - 2t^2$, then acceleration when velocity is zero, is

A. 0

B. $4 \quad \text{units/sec}^2$

C. $-4 \quad \text{units/sec}^2$

D. $-2 \quad \text{units}/\text{sec}^2$

Answer: C

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54. If the displacement of a particle is given by $s = 2t^3 - 5t^2 + 4t - 3$, then its acceleration is $14 \quad \text{ft}/\text{sec}^2$ after to,e

A. 3 sec

B. 4 sec

C. 1 sec

D. 2 sec

Answer: D

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55. If the displacement of a particle is given by $s = 2t^3 - 5t^2 + 4t - 3$, then its displacement when acceleration is $14 \text{ ft}/\text{sec}^2$, is

A. 1 feet

B. 2 feet

C. 3 feet

D. 4 feet

Answer: A

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56. If the displacement of a particle is given by $s = 2t^3 - 5t^2 + 4t - 3$, then its velocity when acceleration is $14 \text{ ft}/\text{sec}^2$, is

A. 16 ft/sec

B. 8 ft/sec

C. 4 ft/sec

D. 2 ft/sec

Answer: B

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57. If the displacement of a particle is $x = t^3 - 4t^2 - 5t$,

then the velocity of particle at t=2 is

A. $-9 \quad \text{units/sec}$

B. 9 units/sec

C. $-18 \quad \text{units/sec}$

D. 18 units/sec

Answer: A

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58. If the displacement of a particle is $x = t^3 - 4t^2 - 5t$,

then the acceleration of particle at t=2 is

A. 2 units/sec^2

B. 4 units/sec^2

C. -2 units/sec^2

D. -4 units/sec^2

Answer: B

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59. If displacement of particle is $s = t^3 - 6t^2 + 9t + 15$, then velocity of the particle at beginning is

A. 18 units/sec

B. 24 units/sec

C. 0 units/sec

D. 9 units/sec

Answer: D

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60. A particle moves under the law $s = t^3 - 4t^2 - 5t$. If its acceleration is 4 units/sec^2, then its displacement is

A. 9 units

B. -9 units

C. 18 units

D. -18 units

Answer: D

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61. A particle moves under the law $s = t^3 - 4t^2 - 5t$. If its acceleration is $4unit\frac{s}{\sec^2,}$ then its velocity is

A. 9 units/sec

B. -9 units/sec

C. 18 units/sec

D. -18 units/sec

Answer: B

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62. If displacement of particle is $s = \frac{t^3}{3} - \frac{t^2}{2} - \frac{t}{2} + 6$,

then velocity of the particle at t=4 sec. is

A. 11.5 units/sec

B. 14.5 units/sec

C. 19.5 units/sec

D. 16.5 units/sec

Answer: A

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63. If displacement of particle is $s = \frac{t^3}{3} - \frac{t^2}{2} - \frac{t}{2} + 6$, then acceleration of the particle when its velocity is $\frac{3}{2}$, is

A. $-1 \quad \text{units/sec}^2$

B. $0 \quad \text{units/sec}^2$

C. $4 \quad \text{units/sec}^2$

D. $3 \quad \text{units/sec}^2$

Answer: D

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64. If displacement of particle is $s = \frac{t^3}{3} - \frac{t^2}{2} - \frac{t}{2} + 6$, then displacement of the particle when velocity is $\frac{3}{2}$, is

A. $\frac{17}{3}$ units

B. $\frac{-17}{3}$ units

C. $\frac{11}{3}$ units

D. $\frac{-11}{3}$ units

Answer: A

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65. If displacement of particle is $x = 160t - 16t^2$, then at t=1and t=9, velocities are

A. equal

B. equal and opposite

C. zero

D. double

Answer: B

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66. A particle moves in a straight line so that it covers distance $at^3 + bt + 5$ meter in t seconds. If its acceleration after 4 seconds is 48 $\text{meters}/\text{sec}^2$, then a=

A. 1

B. 3

C. 2

D. 4

Answer: C

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67. If a particle moving in a straight line and its distance x cms from a fixed point O on the line is given by $x = \sqrt{1 + t^2}$ cms, then acceleration of the particle at t sec. is

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

B. $\frac{-1}{x^2} \text{ cm/sec}^2$

C. $\frac{1}{x^3} \text{ cm/sec}^2$

D. $\frac{-1}{x^3}\ \mathrm{cm/sec}^2$

Answer: C

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

A. constant

B. proportional to t

C. proportional to v

D. proportional to s

Answer: A

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69. A particle moves in a straight line so that its velocity at any point is given by $v^2 = a + bx$, where $a, b \neq 0$ are constants. The acceleration is

A. zero

B. uniform

C. non-uniform

D. indeterminate

Answer: B

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70. If a particle moves such that the displacement is proportional to the square of the velocity acquired, then it acceleration is

A. constant

B. proportional to s

C. proportional to s^2

D. proportional to $\frac{1}{s}$

Answer: A

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71. A stone is thrown vertically upwards from the top of a tower $64m$ high according to the law of motion given by $s = 48t - 16t^2$. The greatest height attained by the stone above ground is

A. 32 meters

B. 64 meters

C. 36 meters

D. 100 meters

Answer: D

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72. A stone, vertically thrown upward is moving in a line. Its equation of motion is $s = 29t - 49t^2$, then the maximum height that the stone reaches is

A. 1323 units

B. 882 units

C. 441 units

D. 1764 units

Answer: C

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73. A bullet is shot horizontally and its distance s cms at time t sec is given by $s = 1200t - 15t^2$ then the distance covered with which the bullet is shot when it comes to the rest is

A. 1200 cm/sec

B. 600 cm/sec

C. 300 cm/sec

D. 0 cm/sec

Answer: A

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74. If a bullet is shot horizontally and its distance s cm at time t seconds is given by $s = 1200t - 15t^2$, then the time required to come to rest is

A. 10 sec

B. 20 sec

C. 40 sec

D. 80 sec

Answer: C

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75. A bullet is shot horizontally and its distance s cms at time t sec is given by $s = 1200t - 15t^2$ then the distance covered with which the bullet is shot when it comes to the rest is

A. 48000 cms.

B. 24000 cms

C. 4800 cms

D. 2400 cms

Answer: B

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76. A particle moves along the curve $6y = x^3 + 2$. Find the points on the curve at which y-co-ordinate is changing 8 times as fast as the x-co-ordinate.

A. (4,11)

B. (4,-11)

C. (-4,11)

D. (-4,-11)

Answer: A

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77. A point on the parabola $y^2 = 18x$ at which the ordinate increases at twice the rate of the abscessa is (1) $(2, 4)$ (2) $(2, \; -4)$ (3) $\left(-\frac{9}{8}, \frac{9}{2}\right)$ (4) $\left(\frac{9}{8}, \frac{9}{2}\right)$

A. (2,4)

B. (2,-4)

C. $\left(\frac{9}{8}, \frac{9}{2}\right)$

D. $\left(\frac{-9}{8}, \frac{9}{2}\right)$

Answer: C

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78. A point source of light is hung 30 feet directly above a straight horizontal path on which a man of 6 feet in height is walking. How fast is the man's shadow lengthening and how fast the tip of shadow is moving when he is walking away from the light at the rate of 100 ft/min.

A. 20 ft/min

B. 25 ft/min

C. 125 ft/min

D. 80 ft/min

Answer: B

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79. A point source of light is hung 30 feet directly above a straight horizontal path on which a man of 6 feet in height is walking. How fast is the man's shadow lengthening and how fast the tip of shadow is moving when he is walking away from the light at the rate of 100 ft/min.

A. 20 ft/min

B. 25 ft/min

C. 125 ft/min

D. 80 ft/min

Answer: C

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80. A ladder of length 20 feet rests against a smooth vertical wall. The lowerend, which is on a smooth horizontal floor is moving away from the wall at the rate of 4 feet/sec. If the lower end is 12 feet away from the wall, then the rate at which the upper end move, is

A. $\frac{16}{3}$ ft/sec

B. $\frac{-16}{3}$ ft/sec

C. 3 ft/sec

D. -$3f\frac{t}{\text{sec}}$

Answer: D

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81. A ladder 10 m long rests against a vertical wall with the lower end on the horizontal ground. The lower end of the ladder is pulled along the ground away from the wall at the rate of 3 m/s. The height of the upper end while it is descending at the rate of 4 m/s, is

A. 8 meters

B. 6 meters

C. $4\sqrt{3}$ meters

D. $5\sqrt{3}$ meters

Answer: B

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82. Aladder of 5 m long rest with one end against a vertical wall of height 3 m and the other end on the lower ground. If its top slides down at the rate of 10 cm/sec, find the rate at which the foot of the ladder is sliding.

A. 0.075 meter/sec.

B. 0.75 meter/sec

C. 0.025 meter/sec

D. 0.25 meter/sec

Answer: A

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83. A ladder is resting with a vertical wall at an angle of 30°. If a man is ascending the ladder of at the rate of 6 feet/sec, then the rate at which the man is approaching the wall, is

A. 9 feet/sec

B. 2 feet/sec

C. 3 feet/sec

D. 6 feet/sec

Answer: C

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84. For a gas equation PV=100, volume V is $25cm^3$, pressure P is measured in dynes/cm^2. If volume is increasing at the rate of $0.25cm^3 \quad /\text{sec.}$, then the rate of change of pressure is

A. $-0.02 \quad \text{dynes}/\text{cm}^2$

B. $0.02 \quad \text{dynes}/\text{cm}^2$

C. $-0.04 \quad \text{dynes}/\text{cm}^2$

D. $0.04 \quad \text{dynes}/\text{cm}^2$

Answer: C

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85. A ship starts from a port at 12 noon and travels due east with a speed of 9 khots/hour. One hour later another starts due south with a speed of 12 knots/hour. Then the rate at which the distance between ships is increasing at 2 pm., is

A. $\frac{3\sqrt{117}}{306}$ knots/hour

B. $\frac{\sqrt{117}}{153}$ knots/hour

C. $\frac{306}{\sqrt{117}}$ knots/hour

D. $\frac{153}{\sqrt{117}}$ knots/hour

Answer: D

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86. 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. $10\sqrt{3}cm^2 / \sec$

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

C. $10cm^2 / \sec$

D. $\frac{10}{\sqrt{3}}cm^2 / \sec$

Answer: A

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87. The length x of a rectangle is increasing at the rate of 3 cm/sec. and the width y is increasing at the rate of 2 cm/sec. If x=10 cm and y=6 cm, then the rate of change of its area is

A. $2cm^2 / \sec$

B. $-2cm^2 / \sec$

C. $38cm^2 / \sec$

D. $-38cm^2 / \sec$

Answer: C

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88. The side of a square is increasing at the rate of 0.5 cm/sec. Find the rate of increase of its area, when the side of square is 20 cm long.

A. $1cm^2 / \sec$

B. $10cm^2 / \sec.$

C. $40cm^2 / \sec$

D. $20cm^2 / \sec$

Answer: D

Watch Video Solution

89. The sides of a square area is increasing at the rate of 0.5 cm/sec. If the side of a square is 10 cm long, then the rate of increase of its perimeter is

A. 2 cm/sec

B. 4 cm/sec

C. 3 cm/sec

D. 5 cm/sec

Answer: A

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90. 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. $\frac{-1}{2}cm/\sec.$

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

D. $\frac{-1}{4}cm/\sec$

Answer: C

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91. If the rate of change of area of a square plate is equal to that of the rate of change of its perimeter, then length of the side, is

A. 4 units

B. 2 units

C. $\frac{1}{4}$ units

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

Answer: B

Watch Video Solution

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

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

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

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

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

Answer: D

Watch Video Solution

93. The edge of a cube is decreasing at the rate of 0.04 cm/sec. If the edge of cube is 10 cm, then the rate of decrease of its surface area is

A. $0.6cm^2/\text{sec}$

B. $1.2cm^2/\text{sec}$

C. $2.4cm^2/\text{sec}$

D. $4.8cm^2/\text{sec}$

Answer: D

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94. एक घन के आयतन $8cm^3/s$ की दर से बढ़ रहा है पृष्ठ क्षेत्रफल किस दर से बढ़ रहा है जबकि इसके किनारे की लंबाई 12 cm है

A. $\frac{1}{54}cm^2/\sec$

B. $\frac{1}{9}cm^2/\sec$

C. $\frac{8}{3}cm^2/\sec$

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

Answer: C

Watch Video Solution

95. If the radius of a circle is 2 cm and is increasing at the rate of 0.5 cm/sec., then the rate of increase of its area is

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

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

C. $3\pi cm^2/\sec$

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

Answer: B

Watch Video Solution

96. Find the rate of change of the area of a circular disc with respect to its circumference when the radius is 3 cm.

A. 1 cm

B. 2 cm

C. 3 cm

D. 6 cm

Answer: C

Watch Video Solution

97. The radius of a circular blot of oil is increasing at the rate of 2 cm/min.

Find the rate of change of its area when its radius is 3 cm.

A. $12\pi cm^2 / \text{ min}$

B. $6\pi cm^2 / \min$

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

D. $2\pi cm^2 / \min$

Answer: A

Watch Video Solution

98. The radius of a circular blot of oil is increasing at the rate of 2 cm/min. The rate of change of its circumference is

A. $2\pi cm / \min$

B. $4\pi cm / \min$

C. $\pi cm / \min$

D. $16\pi cm / \min$

Answer: B

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99. A stone is dropped into a pond. Waves in the form of circles are generated and the radius of the outermost ripple increases at the rate of 2 inches/sec. If the radius is 5 inches, then the rate at which the area increasing, is

A. $20\pi \text{ inches}^2 / \text{sec}$

B. $40\pi \text{ inches}^2 / \text{sec}$

C. $5\pi \quad \text{inches}^2/\text{sec}$

D. $10\pi \quad \text{inches}^2/\text{sec}$

Answer: A

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100. A stone is dropped into a pond. Waves in the form of circles are generated and the radius of the outermost ripple increases at the rate of 2 inches/sec. The rate at which the area is increasing after 5 seconds, is

A. $20\pi \quad \text{inches}^2/\text{sec}$

B. $40\pi \quad \text{inches}^2/\text{sec}$

C. $5\pi \quad \text{inches}^2/\text{sec}$

D. $10\pi \quad \text{inches}^2/\text{sec}$

Answer: B

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101. If the rate of increase of area of a circle is not constant but the rate of increase of perimeter is constant, then the rate of increase of area varies

A. as the square of the perimeter

B. as the radius

C. inversely as the perimeter

D. inversely as the radius

Answer: B

Watch Video Solution

102. The radius of a soap bubble is increasing at the rate of 0.2 cm/sec. It its radius is 5 cm, find the rate of increase of its volume.

A. $5\pi cm^3/\text{sec}$

B. $10\pi cm^3/\text{sec}$

C. $20\pi cm^3/\text{sec}$

D. $40\pi cm^3/\text{sec}$

Answer: C

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103. A spherical soap bubble is expanding so that its radius is increasing at the rate of 0.02 cm/sec. At what rate is the surface area increasing when its radius is 5 cm ? (Take $\pi = 3.14$)

A. $\frac{16\pi}{5}cm^2/\text{sec}$

B. $\frac{2\pi}{5}cm^2/\text{sec}$

C. $\frac{8\pi}{5}cm^2/\text{sec}$

D. $\frac{4\pi}{5}cm^2/\text{sec}$

Answer: D

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104. एक गुब्बारा जो सदैव गोलाकार रहता है का परिवर्तन व्यास $\frac{3}{2}(2x+1)$ है x के सापेक्ष आयतन के परिवर्तन की दर ज्ञात कीजिए

A. $\frac{27\pi}{8}(2x+1)^2$ cubic units/sec

B. $\frac{9\pi}{8}(2x+1)^2$ cubic units/sec

C. $\frac{3\pi}{2}(2x+1)^2$ cubic units/sec

D. $\frac{9\pi}{2}(2x+1)^2$ cubic units/sec

Answer: A

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105. A spherical snow ball is melting so that its volume is decreasing at the rate of 8 cc/sec. Find the rate at which its radius is decreasing when it is 2 cm.

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

B. $\frac{1}{2\pi}$ cm/sec

C. π cm/sec

D. 2π cm/sec

Answer: B

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106. The volume of spherical ball is increasing at the rate of $4\pi \text{cc}/\text{sec}$. If its volume is 288π cc, then the rate of change of its radius is

A. $\frac{\pi}{36}$ cm/sec

B. $\frac{4\pi}{6}$ cm/sec

C. $\frac{1}{36}$ cm/sec

D. $\frac{1}{6}$ cm/sec

Answer: C

Watch Video Solution

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

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

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

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

Answer: A

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

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

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

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

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

Answer: D

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109. 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. $\frac{2}{9}$ meters/min

B. $\frac{-2}{9}$ meters/min

C. $\frac{4}{9}$ meters/min

D. $\frac{-4}{9}$ meters/min

Answer: A

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

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

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

Answer: B

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111. The surface area of a spherical balloon is increasing at the rate of $2 \quad \mathrm{cm}^2/\mathrm{sec}$. At what rate is the volume of the ballon is increasing, when the radius of the ballon is 6 cm ?

A. $6cm^3/\min$

B. $3cm^3/\min$

C. $36cm^3/\min$

D. $18cm^3/\min$

Answer: A

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112. If V denotes the volume and S is the surface area of a sphere. If radius of sphere is 2 cm, then the rate of change of V w.r.t. S is

A. 2 cm

B. 1 cm

C. 2 cm/sec

D. 1 cm/sec

Answer: B

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113. Water is being poured at the rate of $36\ \ m^3/\sec$ in a cylindrical vessel of base radius 3 metres. Find the rate at which water level is rising.

A. $\frac{4}{\pi}$ meter/sec

B. $\frac{2}{\pi}$ meter/sec

C. $\frac{\pi}{4}$ meter/sec

D. $\frac{\pi}{2}$ meter/sec

Answer: A

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114. The radius of a cylinder is increasing at the rate of $3ms^{-1}$ and its altitude is decreasing at the rate of $4ms^{-1}$. The rate of change of volume when radius is $4m$ and altitude is 6m is

A. $144\frac{m^3}{\sec}$

B. $64\pi m^3 / \sec$

C. $80\pi m^3 / \sec$

D. $-80\pi m^3 / \sec$

Answer: C

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115. A cone has a depth of 15cm and a base of 6 cm radius. Water is poured into it at the rate of $\frac{16}{5}\pi$ cc/min.Find the rate at which the level of water in the cone is rising when the depth is 4 cm.

A. $\frac{5}{4}$ cm/min

B. $\frac{5}{2}$ cm/min

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

D. $\frac{5}{8}$ cm/min

Answer: A

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116. Sand is pouring at the rate of $12cm^3/\text{sec}$. The falling sand forms a cone on the ground in such a way that the height of the cone is always $\left(\frac{1}{6}\right)^{th}$ of the radius of the base. If the height of sand is 4 cm, then the rate at which height of sand increasing, is

A. $\frac{1}{12\pi}$ cm/sec

B. $\frac{1}{6\pi}$ cm/sec

C. $\frac{1}{48\pi}$ cm/sec

D. $\frac{1}{24\pi}$ cm/sec

Answer: C

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117. A water is poured into an inverted cone whose semi-vertical angle is 45° so that the level of water increases at the rate of 1 cm/sec. then the rate at which the volume of water is increasing when height of water in cone is 2 cm is

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

B. $48\pi cm^3/\text{sec.}$

C. $16\pi cm^3/\text{sec.}$

D. $64\pi cm^3/\text{sec.}$

Answer: A

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118. A water is poured into an inverted cone at the rate of 270 cc/sec. The radius of the cone is equal to the depth of water in it. If the depth of water in the cone is 18 cm, then the rate at which the water level is rising, is

A. $\frac{5}{3\pi}$ cm/sec

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

C. $\frac{3\pi}{5}$ cm/sec

D. $\frac{3\pi}{6}$ cm/sec

Answer: B

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119. A kite is flying at a height of 16 meters. A boy who is flying it, is carrying it horizontally at the rate of 1.2 meter/sec. If the height of the kite remains same, the string is straight and the length of string released is 20 meters, then rate at which the string being pair out, is

A. 0.36 meter/sec

B. 0.48 meter/sec

C. 0.60 meter/sec

D. 0.72 meter/sec

Answer: D

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120. An aeroplane at an altitude of 1 km flying horizontally at 800 km/hr passes directly over an observer. Find the rate at which it is approaching the observer when it is 1250 metres away from him.

A. 120 km/hr

B. 240 km/hr

C. 360 km/hr

D. 480 km/hr

Answer: D

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121. Find the approximate value of $(4.01)^3$.

A. 66.44

B. 64.84

C. 64.88

D. 64.48

Answer: D

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122. Find the approximate values of :

$(4.01)^5$

A. 1036.08

B. 1036.06

C. 1036.80

D. 1036.60

Answer: C

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123. Find the approximate value of $\sqrt{8.95}$

A. 2.9916

B. 2.9917

C. 12.8000

D. 2.1969

Answer: B

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124. Find the approximate values of :

$\sqrt{144.02}$

A. 12.0083

B. 12.0800

C. 12.8000

D. 12.0008

Answer: D

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125. The approximate value of $\sqrt[3]{0.009}$ is

A. 0.2083

B. 0.2038

C. 0.2084

D. 0.2048

Answer: A

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126. Find the approximate values of :

$\sqrt[3]{26.96}$

A. 2.9985

B. 2.9984

C. 2.9988

D. 2.9898

Answer: A

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127. Find the approximate value of $\sqrt[3]{27.027}$.

A. 3.001

B. 3.01

C. 3.003

D. 3.037

Answer: A

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128. The approximate value of $\sqrt[3]{28}$ is

A. 3.038

B. 3.035

C. 3.036

D. 3.037

Answer: D

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129. Find the approximate value of $\sqrt[3]{63}$

A. 3.09792

B. 3.09791

C. 3.9792

D. 3.9791

Answer: C

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130. The approximate value of $\sqrt[5]{32.1}$ is

A. 2.125

B. 2.0015

C. 2.0125

D. 2.00125

Answer: D

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131. Find the approximate value of $\sqrt[10]{0.999}$.

A. 0.0998

B. 0.9998

C. 0.0999

D. 0.9999

Answer: D

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132. Using differentials, find the approximate value of $(3.968)^{\frac{3}{2}}$

A. 7.409

B. 7.904

C. 7.804

D. 7.408

Answer: B

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

A. 0.5051

B. 0.5052

C. 0.5151

D. 0.5152

Answer: D

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134. The approximate value of $\sin(60^\circ 0'10''), \quad \text{if} \ \ 1^\circ = 0.175^\circ$ is

A. 0.8660243

B. 0.8660244

C. 0.866243

D. 0.866244

Answer: A

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135. The approximate value of $\sin(60^{\circ}45')$, if $1^{\circ} = 0.0175^{\circ}$ is

A. 0.8752

B. 0.8762

C. 0.8725

D. 0.8726

Answer: D

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136. Find the approximate value of cos $(29^\circ 30')$ given

$1^\circ = 0.0175^c$ and $\cos 30^\circ = 0.8660$

A. 0.8604

B. 0.8603

C. 0.8704

D. 0.4928

Answer: C

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137. Find the approximate values of :

$\cos(60^\circ 30')$, given $1^\circ = 0.0175^c$ and $\sin 60^\circ = 0.8660$

.

A. 0.4934

B. 0.4938

C. 0.4924

D. 0.4928

Answer: C

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138. The approximate value of $\cos(60^\circ 40')$, if $1^\circ = 0.0175^\circ, \sin = 60^\circ = 0.8660$ is

A. 0.4898

B. 0.4899

C. 5.0202

D. 5.0101

Answer: B

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139. Find the approximate values of :

$\cos(89^\circ 30), \quad \text{given} \quad 1^\circ = 0.0175^c.$

A. 0.00875

B. 0.0875

C. 0.0175

D. 0.0876

Answer: A

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140. Find the approximate values of :

$\tan(44^\circ), \quad \text{given} \quad 1^\circ = 0.0175^c.$

A. 0.09825

B. 0.9825

C. 0.0965

D. 0.965

Answer: D

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141. The approximate value of $\tan(45^\circ 10')$, if $1^\circ = 0.0175^\circ$ is

A. 1.0065

B. 1.0085

C. 0.0965

D. 1.0058

Answer: D

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142. The approximate value of $\sin^{-1}(0.51)$, if $\frac{1}{\sqrt{3}} = 0.5774$ is

A. $\frac{\pi}{3} + 0.1154$

B. $\frac{\pi}{3} + 0.1155$

C. $\frac{\pi}{6} + 0.01155$

D. $\frac{\pi}{6} + 0.01154$

Answer: C

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

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

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

C. $\frac{\pi}{4} - 0.05$

D. $\frac{\pi}{4} - 0.5$

Answer: A

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144. Find the approximate values of :

$\tan^{-1}(1.001)$.

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

B. $\frac{\pi}{4} + 0.0005$

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

D. $\frac{\pi}{4} + 0.005$

Answer: B

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145. Find the approximate values of :

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

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

B. $\frac{\pi}{4} + 0.0005$

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

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

Answer: B

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146. Find the approximate values of :

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

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

B. $\frac{\pi}{4}+0.0005$

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

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

Answer: D

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147. Find the approximate value of $e^{1.005}$ (given $e = 2.7183$)

A. 2.7237

B. 2.2737

C. 2.3772

D. 2.7273

Answer: A

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148. Find the approximate value of $e^{1.005}$ (given $e = 2.7183$)

A. 2.7319

B. 2.7318

C. 2.8542

D. 2.8541

Answer: A

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149. Find the approximate value of $:e^{2.1}$ given that $e^2 = 7.389$

A. 8.1279

B. 8.1297

C. 8.1278

D. 8.1287

Answer: A

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150. $\log_{10}(4.04)$, it being given that $\log_{10} 4 = 0.6021$ and $\log_{10} e = 0.4343$

A. 1.3874

B. 1.3964

C. 1.4864

D. 1.3864

Answer: B

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151. Find the approximate value of $\log_e(9 \cdot 01)$ given $\log_e 3 = 1 \cdot 0986$

A. 2.1988

B. 2.1983

C. 2.1987

D. 2.1982

Answer: B

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152. Find the approximate value of $\log_e(101)$ given $\log_e 10 = 2 \cdot 3026$

A. 4.6152

B. 4.6052

C. 4.6125

D. 4.6025

Answer: A

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153. Find the approximate values of :

$\log_{10}(1002), \quad \text{given that} \quad \log_{10} e = 0.4343.$

A. 3.0086

B. 3.0087

C. 3.00086

D. 3.00087

Answer: D

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154. Find the approximate value of $\log_{10}(1016)$ given $\log_{10} e = 0.4343$

A. 3.006949

B. 3.006948

C. 3.06949

D. 3.06948

Answer: A

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155. Find the approximate values of :

$f(x) = x^3 - 3x + 5$ at $x = 1.99$.

A. 6.094

B. 3.019

C. 6.91

D. 6.19

Answer: C

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156. The approximate value of $x^3 - 2x^2 + 3x + 2,$ when x=3.02 is

A. 20.36

B. 20.036

C. 20.18

D. 20.018

Answer: A

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157. Find the approximate values of :

$$f(x) = x^3 + 5x^2 - 7x + 10 \text{ at } x = 1.1.$$

A. 9.06

B. 9.60

C. 9.66

D. 9.69

Answer: B

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158. 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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159. If $f(x) = 2x^2 + 5x + 2$, then find the approximate value of $f(2.01)$.

A. 27.02

B. 27.20

C. 27.04

D. 27.40

Answer: D

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160. The approximate surface area of a sphere of radius 6.01 cm is

A. $(12.024)\pi \quad \text{sq. cm}$

B. $(12.24)\pi \quad \text{sq. cm}$

C. $(144.048)\pi \quad \text{sq. cm}$

D. $(144.48)\pi \quad \text{sq. cm}$

Answer: D

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161. A function f is defined by $f(x) = x^2$ in $[2, 3]$.

Which of the following is correct ?

A. Rolle's theorem is satisfied in [2,3]

B. Rolle's theorem is not satisfied in [2,3]

C. f is not continuous on [2,3]

D. f is not differentiable in (2,3)

Answer: B

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162. The point where the function $f(x) = x^2 - 4x + 10$ on [0,4] satisfies the conditions of Rolle's theorem is

A. x=1

B. x=2

C. x=3

D. x=1.5

Answer: B

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163. If $f(x) = x^2 - 5x + 9, x \in [1, 4]$, then Rolle's theorem satisfies at

A. $x = 2$

B. $x = 2.6$

C. $x = 2.5$

D. $x = 3.5$

Answer: C

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164. If $f(x) = 2(x-1)^2, x \in [0, 2]$ then Rolle's theorem satisfies at

A. $x = 0.5$

B. $x = 1$

C. $x = 1.5$

D. $x = 2$

Answer: B

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165. If $f(x) = (x-1)(2x-3), x \in [1, 3]$, then

A. Rolle's theorem is not satisfied in [1,3]

B. Rolle's theorem is satisfied in [1,3]

C. f(1)=f(3)

D. f is not continuous on [1,3]

Answer: A

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166. If $f(x) = (x-1)(x-2)(x-3), x \in [1, 3]$, then

A. Rolle's theorem is satisfied in [1,3]

B. Rolle's theorem is satisfied in [1,3]

C. $f(1) \neq f(3)$

D. $f(1) = f(3) = 2$

Answer: A

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167. If $f(x) = x^{\frac{2}{3}}, x \in [-1, 1]$, then

A. f is differentiable in (-1,1)

B. f is not continuous on [1,-1]

C. `Rolle's theorem is applicable for f

D. Rolle's theorem is not applicable for f

Answer: D

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168. If $f(x) = |x|, x \in [-2, 2]$, then

A. f is not differentiable at x=0

B. f is not continuous at x=0

C. Rolle's theorem is applicable for f

D. $f(2) \neq f(-2)$

Answer: A

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169. If $f(x) = x^3 + bx^2 + ax$ satisfies the conditions on Rolle's theorem on $[1, 3]$ with $c = 2 + \frac{1}{\sqrt{3}}$.

A. a=11, b=6

B. a=-11, b=6

C. a=11, b=-6

D. a=-11,b=-6

Answer: C

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170. 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=11

D. a=6

Answer: C

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171. Verify Rolle's theorem for the following functions

$f(x) = \sin x + \cos x + 5, x \in [0, 2\pi]$

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

B. $x = \frac{3\pi}{4}$

C. $x = \frac{5\pi}{4}$

D. $x = \frac{\pi}{4}, \frac{5\pi}{4}$

Answer: D

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172. If $f(x) = e^x \sin x, x \in [0, \pi]$, then

A. Rolle's theorem is not satisfied in $[0, \pi]$

B. Rolle's theorem is satisfied in $[0, \pi]$

C. $f(0) \neq f(\pi)$

D. f is not differentiable in $(0, \pi)$

Answer: B

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173. A function f is defined by $f(x) = x^x \sin x$ in $[0, \pi]$.

Which of the following is not correct?

A. f is continuous in $[0, \pi]$

B. f is differentiable in $[0, \pi]$

C. $f(0) = f(\pi)$

D. Rolle's theorem is not true in $[0, \pi]$

Answer: D

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

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

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

D. π

Answer: D

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175. 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. $x = \frac{\pi}{2}$

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

C. $x = \frac{3\pi}{4}$

D. $x = \pi$

Answer: A

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176. If Rolle's theorem holds for the function $f(x) = (x-2)\log x, x \in [1, 2]$, show that the equation $x \log x = 2 - x$ is satisfied by at least one value of x in $(1, 2)$.

A. $x \log x = 2x - 1$

B. $x \log x = 1 - 2x$

C. $x \log x = x - 2$

D. $x \log x = 2 - x$

Answer: D

Watch Video Solution

177. If Rolle's theorem holds for the function $f(x) = (x-2)\log x, x \in [1, 2]$, show that the equation $x \log x = 2 - x$ is satisfied by at least one value of x in $(1, 2)$.

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

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

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

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

Answer: B

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178. The equation $x \log x = 3 - x$ has, in the interval (1,3) :

A. no root

B. exactly one root

C. at most one root

D. at least one root

Answer: D

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179. Verify LMVT for the following function $f(x) = x^2 - 3x - 1, x \in \left[-\frac{11}{7}, \frac{13}{7}\right]$

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

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

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

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

Answer: A

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180. Verify $LMVT$ for the following functions: $f(x) = x(2-x), x \in [0, 1]$

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

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

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

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

Answer: C

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181. If LMVT is applicable for $f(x) = x(x+4)^2, x \in [0, 4]$, then c=

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

B. $\frac{-4+2\sqrt{3}}{3}$

C. $\frac{-8+4\sqrt{13}}{3}$

D. $\frac{-8-4\sqrt{13}}{3}$

Answer: C

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182. Find c if LMVT is applicable for $f(x) = x(x-1)(x-2), x \in \left[0, \frac{1}{2}\right]$

A. $1 + \frac{\sqrt{21}}{6}$

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

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

D. $1 - \frac{\sqrt{7}}{2}$

Answer: B

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183. If mean value theorem holds for the function $f(x) = (x-1)(x-2)(x-3), x \in [0, 4]$, then c=

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

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

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

D. $2 \pm \sqrt{3}$

Answer: B

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184. 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. $\frac{a+b}{2}$

B. $\sqrt{ab}$

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

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

Answer: B

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185. For the function $f(x)=x+\frac{1}{x}, x \in [1, 3]$, the value of c for mean value therorem is

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

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

C. $-\sqrt{3}$

D. $\sqrt{3}$

Answer: D

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186. If f and g are differentiable function in (0,1] satisfying f(0)=2=g(1),g(0)=0 and f(1)=6, then for some

$c \in (0, 1)$.

A. $2f'(c) = g'(c)$

B. $2f'(c) = 3g'(c)$

C. $f'(c) = g'(c)$

D. $f'(c) = 2g'(c)$

Answer: D

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

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

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

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

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

Answer: A

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188. Let $f(x) = e^x, x \in [0, 1]$, then a number c of the Largrange's mean value theorem is

A. $e - 1$

B. $1 - e$

C. $\log(e - 1)$

D. `log (1-e)

Answer: C

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189. Verify Lagrange's mean-value theorem for each of the following functions

$f(x) = \log x \quad \text{on} \quad [1, e]$

A. $e - 1$

B. $1 - e$

C. $\dfrac{1}{e-1}$

D. $\dfrac{1}{1-e}$

Answer: A

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190. A value of c for which the conclusion of Mean value theorem holds for the function $f(x) = \log_e x$ on the interval [1, 3] is

A. $\log_3 e$

B. $\log_e 3$

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

D. $2\log_3 e$

Answer: D

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

A. $(2, \infty)$

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

C. $(-1, \infty)$

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

Answer: C

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

A. increasing

B. decreasing

C. increasing and decreasing

D. neither increasing nor decreasing

Answer: A

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193. Find the values of x such that $f(x) = x^3 + 12x^2 + 36x + 6$ is an increasing function.

A. $x \in (-\infty, -6)$ or $x \in (2, \infty)$

B. $x \in (-\infty, -6)$ or $x \in (-2, \infty)$

C. $x \in (-\infty, 6)$ or $x \in (-2, \infty)$

D. $x \in (-\infty, 6)$ or $x \in (2, \infty)$

Answer: B

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194. The function $f(x) = 2 - 3x + 3x^2 - x^3, x \in R$ is

A. neither increasing nro decreasing

B. increasing

C. decreasing for all $x \in R, x \neq 1$

D. increasing for all $x \in R, x \neq 1$

Answer: C

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195. The function $f(x) = x^3 - 6x^2 + 12x - 16, x \in R$ is

A. [1,2]

B. [1,2)

C. (1,2]

D. (1,2)

Answer: D

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196. The function $f(x) - x^3 - 6x^2 + 12x - 16, x \in R$ is

A. increasing for all $x \in R, x \neq 2$

B. decreasing

C. neither increasing nor decreasing

D. decreasing for all $x \in R, x \neq 2$

Answer: A

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197. The function $f(x) = 2x^3 - 15x^2 + 36x + 1$ is increasing in the interval

A. $x \leq 2 \quad \text{or} \quad x \geq 3$

B. $x < 2 \quad \text{or} \quad x > 3$

C. $x \geq 2 \quad \text{or} \quad x \leq 3$

D. $x > 2 \quad \text{or} \quad x < 3$

Answer: B

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198. Find the values of x such that

$f(x) = 2x^3 - 15x^2 - 84x - 7$ is a decreasing function.

A. $-2 < x < 7$

B. $2 < x < 7$

C. $x < -2$

D. $x > 7$

Answer: A

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199. The function $f(x) = 2x^3 - 15x^2 - 144x - 7$ is increasing for

A. $x > -3 \text{ or } x < 8$

B. $x < -3 \text{ or } x > 8$

C. $x > 3 \quad \text{or} \quad x < -8$

D. $x < 3 \quad \text{or} \quad x > -8$

Answer: B

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200. Find the values of x such that

$f(x) = 2x^3 - 15x^2 - 84x - 7$ is a decreasing function.

A. $3 < x < 8$

B. $3 \leq x \leq 8$

C. $-3 < x < 8$

D. $-3 \leq x \leq 8$

Answer: C

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201. The function $f(x) = x^4 - 2x^3 + 1$ is decreasing for

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

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

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

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

Answer: D

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202. The function $f(x)=\frac{7}{x}-3, x \in R, x \neq 0$ is

A. increasing for $x>0$

B. decreasing for $x<0$

C. increasing for all $x \in R, x \neq 0$

D. decreasing for all $x \in R, x \neq 0$

Answer: D

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203. The function $f(x)=\frac{3}{x}+10, x \neq 0$ is

A. neither increasing nro decreasing

B. increasing for all $x \in R, x \neq 0$

C. decreasing for all $x \in R, x \neq 0$

D. decreasing for all $x < 0$

Answer: C

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204. The function $f(x) = x - \frac{1}{x}, x \in R, x \neq 0$ is

A. decreasing for all $x \in R, x \neq 0$

B. increasing for all $x \in R, x \neq 0$

C. neither increasing nor decreasing

D. dereasing for all $x \neq R$

Answer: B

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205. The function $f(x) = \frac{x-1}{x+1}, x \neq -1$ is

A. decreasing for all $x \in R, x \neq -1$

B. increasing for all $x \in R, x \neq -1$

C. neither increasing nor decreasing

D. decreasing for all $x \in R$

Answer: B

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206. The function $f(x) = \frac{x}{x^2 - 1}$ increasing, if

A. $-1 < x$

B. $x > 1$

C. $-1 < x \quad \text{or} \quad x > 1$

D. $-1 < x < 1$

Answer: D

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207. The function $f(x) = \frac{x}{x^2 + 1}$ decreasing, if

A. $x < \; -1 \text{ and } x > 1$

B. $-1 < x < 1$

C. $x < -1 \text{ or } x > 1$

D. $x \leq 1 \text{ and } x \geq 1$

Answer: C

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208. The function $f(x) = \cos x, 0 \leq x \leq \pi$ is

A. decreasing

B. increasing

C. neither increasing nor decreasing

D. increasing for $0 \leq x \leq \pi$

Answer: A

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209. $f(x) = \frac{e^{2x} - 1}{e^{2x} + 1}$ is

A. trigonometric

B. even

C. decreasing

D. increasing

Answer: D

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210. If $f(x) = xe^{x(1-x)}$, then f(x) is

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

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

C. decreasing on R

D. increasing on R

Answer: B

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211. Function $f(x) = x^2 - 3x + 4$ has minimum value at

x = ...

A. 0

B. 1

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

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

Answer: D

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212. If $f(x) = 2x^3 - 21x^2 + 36x - 20$, then

A. f has maxima at x=1

B. f has minima at x=1

C. f has maximum value -128

D. f has minimum value -3

Answer: A

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213. If $f(x) = 2x^3 - 21x^2 + 36x - 20$, then

A. f has maxima at x=6

B. f has minima at x=6

C. f has maximum value -128

D. f has minimum value -3

Answer: B

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214. If $f(x) = 2x^3 - 21x^2 + 36x - 20$, then

A. f has maxima at x=6

B. f has minima at x=1

C. f has maximum value -3

D. f has minimum value -3

Answer: C

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215. If $f(x) = 2x^3 - 21x^2 + 36x - 20$, then

A. f has maxima at x=6

B. f has minima at x=1

C. f has maximum value -128

D. f has minimum value -128

Answer: D

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216. If $f(x) = x^3 - 9x^2 + 24x$, then f

A. has maximum value =16

B. has minimum value =10

C. has minima at x=2

D. has maxima at x=2

Answer: D

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217. If $f(x) = x^3 - 9x^2 + 24x,$ then f

A. has minima at x=4

B. has maxima at x=4

C. has maximum value =16

D. has minimum value =-16

Answer: A

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218. If $f(x) = x^3 - 9x^2 + 24x$, then f

A. has maximum value =36

B. has minimum value =16

C. has minima at x=2

D. has maxima at x=4

Answer: B

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219. Examine the function $f(x) = x^3 - 9x^2 + 24x$ for maxima and minima.

A. has maximum value =36

B. has minimum value =16

C. has minima at x=2

D. has maxima at x=4

Answer: C

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220. Examine the following functions for maxima and minima :

$f(x) = 3x^3 - 9x^2 - 27x + 15$

A. f has maximum value 66

B. f has minimum value 30

C. f has maxima at x=3

D. f has minima at x=3

Answer: D

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221. If $f(x) = 3x^3 - 9x^2 - 27x + 15$,t hen the maximum value of $f(x)$ is

A. f has maximum value 30

B. f has minimum value 30

C. f has maxima at x=3

D. f has minima at x =-1

Answer: A

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222. If $f(x) = 3x^3 - 9x^2 - 27x + 15$, then

A. f has maximum value 66

B. f has minimum value -66

C. f has maxima at x=3

D. f has minima at x=-1

Answer: B

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223. Examine the following functions for maxima and minima :

$f(x) = 3x^3 - 9x^2 - 27x + 15$

A. f has maximum value 66

B. f has minimum value 30

C. f has maxima at x=-1

D. f has minima at x=-1

Answer: C

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224. If $f(x) = x^3 - 3x,$ then

A. f has extreme values x=1, -1

B. f has minimum value 30

C. f has minima at x=-1

D. f has maximum value -2

Answer: A

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225. If $f(x) = x^3 - 3x,$ then

A. f has maxima at x=-1

B. f has minima at x=-1

C. f has maximum value 4

D. f has minimum value 2

Answer: A

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226. If $f(x) = x^3 - 3x,$ then

A. f has minima at x=-1

B. f has maxima at x=1

C. f has maixmum value 2

D. f has minimum value 2

Answer: C

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227. If $f(x) = x^3 - 3x$, then

A. f has minima at x=-1

B. f has maxima at x=1

C. f has maximum value -2

D. f has minimum value -2

Answer: D

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228. If $f(x) = x^3 - 3x$, then

A. f has minima at x=1

B. f has maxima at x=1

C. f has maximum value -2

D. f has minimum value 2

Answer: A

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229. If $f(x) = x^2 + \frac{16}{x^2}$, then

A. f has minima at $x = \pm 2$

B. f has maxima at $x = \pm 2$

C. f has maximum value 8

D. f has minimum value -8

Answer: A

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230. If $f(x) = x^2 + \frac{16}{x^2}$, then

A. f has maximum value 6

B. f has minimum value 8

C. f has maxima $at x = \pm 2$

D. f has minima at $x = \pm 4$

Answer: B

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231. If $f(x) = \frac{6}{x^2 + 2}$, then

A. f has maxima at x=3

B. f has minima at x=0

C. f has maximum value 3

D. f has minimum value 0

Answer: C

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232. If $f(x) = \frac{6}{x^2 + 2}$, then

A. f has maximum value 0

B. f has minimum value 3

C. f has minima at x=3

D. f has maxia at x=0

Answer: D

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233. If $f(x) = a + bx^2 + cx^4 + dx^6$, where a,b,c,d all are positive constants, then

A. f has only one point of mimimum

B. f has only one point of maximum

C. f has only two point of mimimum

D. f has no point of mimimum

Answer: A

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234. If x = -1 and x = 2 are extreme points of f(x) = $\alpha \log|x| + \beta x^2 + x$, then

A. $\alpha = -6, \beta = \frac{1}{2}$

B. $\alpha = -6, \beta = \frac{-1}{2}$

C. $\alpha = 2, \beta = \frac{-1}{2}$

D. $\alpha = 2, \beta = \frac{1}{2}$

Answer: C

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235. 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. 0

B. 4

C. -8

D. -4

Answer: A

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236. Maximum value of $\sin\theta + \cos\theta$ in $\left(0, \frac{\pi}{2}\right)$ is

A. 0

B. 2

C. $\sqrt{2}$

D. $-\sqrt{2}$

Answer: C

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237. The maximum value of $f(x) = a\sin x + b\cos x$ is

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

B. $\sqrt{(a^2+b^2)}$

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

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

Answer: B

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238. The minimum value of $f(x) = a\sin x + b\cos x$ is

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

B. $\sqrt{(a^2+b^2)}$

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

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

Answer: A

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239. If $a^2 > b^2$, then the minimum value of $f(x) = a^2\cos^2 x + b^2\sin^2 x$ is

A. $a^2 - b^2$

B. $a^2 + b^2$

C. a^2

D. b^2

Answer: D

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240. The function f(x)=log x

A. has maxima at x=e

B. has minima at x=e

C. has neither maxima nor minima

D. has maximum value 1

Answer: C

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241. The function $f(x) = x \log x$

A. has maximum value $\frac{1}{e}$

B. has maximum value $\frac{-1}{e}$

C. has minimum value $\frac{1}{e}$

D. has minimum value $\frac{-1}{e}$

Answer: D

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242. On [1,e] the greatest value of $x^2 \log x$ is

A. $-e^2$

B. e^2

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

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

Answer: B

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243. 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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244. The function $f(x) = x^2 e^x$ has minimum value

A. 0

B. e

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

D. $\frac{4}{e^2}$

Answer: A

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245. The function $f(x) = x^2 e^x$ has maximum value

A. 0

B. e

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

D. $\frac{4}{e^2}$

Answer: D

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246. The function $f(x) = x^x$ has

A. minima at x=e

B. maxima at x=e

C. maxima at $x = \frac{1}{e}$

D. minima at $x = \frac{1}{e}$

Answer: D

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247. The value of a for which the sum of the square of the roots of the equation $x^2 - (a-2)x - a + 1 = 0$ is least, is

A. 0

B. 1

C. 2

D. 3

Answer: B

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

A. 3

B. 4

C. 1

D. 2

Answer: D

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249. The real numbers which must exceeds its cube is

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

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

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

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

Answer: B

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250. If $x, y \in R^{+}$ satisfying $x + y = 3,$ then the maximum value of x^2y is.

A. 2

B. -2

C. 4

D. -4

Answer: C

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251. Two parts of the number 20 such that their product is maximum are

A. 5,15

B. 12,8

C. 10,10

D. 1,19

Answer: C

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252. Divide the number 84 into two parts such that the product of one part and the square of other is maximum.

A. 42,42

B. 40,44

C. 50,34

D. 28,56

Answer: D

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253. The sum of squares of two parts of a number 100 is minimum, then two parts are

A. 50,50

B. 25,75

C. 40,60

D. 30,70

Answer: A

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254. The combined resistance R of two resistors R_1 and R_2 where $R_1, R_2 > 0$ is given by

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$

If $R_1 + R_2 = C$ (constant), show that the maximum reistance R is obtained by chossing $R_1 = R_2$

A. $R_1 = R_2$

B. $R_1 = 2R_2$

C. $R_2 = 2R_1$

D. $R_2 = CR_1$

Answer: A

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255. A telephone company in the town has 5000 subscribers on its list and collects fiexed rent company proposes to increases annual rent and one subscriber will be discontinued. For maximum annual income to the company, the increased annual rent is

A. Rs 2000

B. Rs 500

C. Rs 1500

D. Rs 1000

Answer: D

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256. A manufacturer can sell x items at the price of Rs. $(330 - x)$ each. The cost of producing xitems is Rs.

$x^2 + 10x - 12$. How many items must be sold so that his profit is maximum?

A. 20

B. 40

C. 60

D. 80

Answer: D

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257. Find the position of the point P on seg AB of length 8 cm, so that $AP^2 + BP^2$ is minimum.

A. AP=2BP

B. AP=BP

C. AP+2BP=0

D. AP+BP=0

Answer: B

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258. Two sides of a triangle are given. The angle between them such that the area is maximum, is given by

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

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

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

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

Answer: B

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259. The perimeter of a triangle is 10 cm. If one of the side is 4 cm, then for its maximum area, remaining two sides are

A. 3 cm, 3 cm

B. 2 cm, 4 cm

C. 5 cm, 1 cm

D. 3.5 cm, 2.5 cm

Answer: A

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

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

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

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

D. π

Answer: A

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261. A rectangle has an area of 50 cm^2. Find its dimensions for least perimeter.

A. 5 cm, 5 cm

B. $\sqrt{2}cm, \sqrt{2}cm$

C. $5\sqrt{2}cm, 5\sqrt{2}cm$

D. $\frac{5}{\sqrt{2}}cm, \frac{5}{\sqrt{2}}cm$

Answer: C

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262. A rod of 108 cm long is bent into a rectangle. When area of rectangle is maximum its dimension are

A. 20 cm, 34 cm

B. 22 cm, 32 cm

C. 27 cm, 27 cm

D. 17 cm, 37 cm

Answer: C

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263. A metal wire of 36 cm long is bent to form a rectangle. Find its dimensions when its area is maximum.

A. 10 cm, 8 cm

B. 6 cm, 12 cm

C. 14 cm, 4 cm

D. 9 cm, 9 cm

Answer: D

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264. A wire of length l is cut into two parts. One part is bent into a circle of radius r and other part into a square of side x. The sum of areas of circle and square is least, if

A. $r = x$

B. $r = 3x$

C. $r = \frac{x}{3}$

D. $r = \frac{x}{2}$

Answer: D

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265. 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. $2x = (\pi + 4)r$

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

C. $x = 2r$

D. $2x = r$

Answer: C

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266. A rectangle is inscribed in a semicircle of radius 1 unit. If its two vertices lie on the diameter, for largest size, then its dimensions are

A. Length $=\sqrt{2}$, breadth $=\frac{1}{\sqrt{2}}$

B. Length $=\sqrt{3}$, breadth $=\frac{1}{2}$

C. Length $=\frac{2\sqrt{3}}{\sqrt{2}}$, breadth $=\frac{1}{3}$

D. Length $=\frac{1}{\sqrt{2}}$, breadth $=\sqrt{2}$

Answer: A

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267. A window is in the form of a rectangle surmounted by a semi-circle. If the total perimeter of the window is $30\ \mathrm{m}$, find the dimensions of the window so that maximum light is admitted.

A. $\frac{20}{4+\pi}m, \frac{20}{4+\pi}m$

B. $\frac{30}{4+\pi}m, \frac{30}{4+\pi}m$

C. $\frac{20}{4+\pi}m, \frac{40}{4+\pi}m$

D. $\frac{30}{4+\pi}m, \frac{60}{4+\pi}m$

Answer: B

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268. A rectangular sheet of paper has the area 24 sq. meters. The margin at the top and bottom is 75 cm and sides 50 cm each. What are the dimensions of paper if the area of the printed space is maximum ?

A. 4 m, 6 m

B. 5 m, 5,

C. 3 m, 7 m

D. 2 m, 8 m

Answer: A

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269. If a rectangle of maximum area is inscibed in the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, then the dimensions are

A. $a\sqrt{2}, b\sqrt{2}$

B. $\frac{a}{\sqrt{2}}, \frac{b}{\sqrt{2}}$

C. $\frac{1}{2\sqrt{a}}, \frac{1}{2\sqrt{b}}$

D. $\frac{1}{\sqrt{2a}}, \frac{1}{\sqrt{2b}}$

Answer: A

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270. 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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271. If P is the perimeter and r is the radius of a sector, then the area of the sector is maximum, if

A. P=r

B. P=2r

C. P=3r

D. P=4r

Answer: D

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272. From a square cardboard of side 18 cms an open tank is made by cutting off equal squares from the corners of cardboard and turning up the sides. The maximum volume of the tank is

A. $423cm^3$

B. $432cm^3$

C. $444cm^3$

D. $422cm^3$

Answer: B

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273. From a metal sheet of area 192 sq. cm, a box with square base and open top is made. For maximum volume of box its dimensions are

A. 8 cm, 4 cm, 4 cm

B. 8 cm, 6 cm, 4 cm

C. 6 cm, 6 cm, 8 cm

D. 8 cm, 8 cm, 4 cm

Answer: D

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274. Determine the points on the curve $x^2 = 4y$ which are nearest to the point $(0,\ 5)$.

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

B. $\left(\pm 2\sqrt{3}, 3\right)$

C. $\left(-2\sqrt{3} \pm 3\right)$

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

Answer: B

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275. The shortest distance between line y-x=1 and curve $x = y^2$ is

A. $\frac{3\sqrt{2}}{8}$

B. $\frac{2\sqrt{3}}{8}$

C. $\frac{3\sqrt{2}}{5}$

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

Answer: A

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276. A right circular cone have slant height 3 cm. Then its volume is maximum at height

A. 3 cm

B. $\sqrt{3}$ cm

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

D. $\frac{1}{\sqrt{3}}$ cm

Answer: B

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277. The height of the cone of maximum volume inscribed in a sphere of radius R is

A. $h = \frac{4r}{3}$

B. $h = \frac{3r}{4}$

C. $h = \frac{4}{3r}$

D. $h = \frac{3}{4r}$

Answer: A

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278. An open cylindrical tank whose base is a circle is to be constructed of metal sheet so as to contain a volume of $\pi a^3 cu. cm$ of water.Find the dimensions so that the quantity of metal sheet required is a minimum.

A. Radius=2a cm, Height =2a cm

B. Radius =2a cm, Height=a cm

C. Radius =a cm, Height =a cm

D. Radius = acm, Height = 2a cm

Answer: C

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279. Find the maximum volume of right circular cylinder, if the sum of its radius and height is 6 units.

A. 4π cu cm

B. 8π cu cm

C. 16π cu cm

D. 32π cu cm

Answer: D

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280. If h is the height and r is the base radius of an open right circular cylinder of given volume has least surface area, then

A. h=3r

B. h=4r

C. h=r

D. h=2r

Answer: C

281. 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

282. The normal to the curve $y(x-2)(x-3)=x+6$ at the point where the curve intersects the y-axis passes through the point

A. $\left(\frac{1}{2}, \frac{1}{3}\right)$

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

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

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

Answer: C

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