1 Basic Maths and Calculus (Mathematical Tools)

Fraction and Decimal

1. $a = 0.4$, $b = 0.40$, $c = 0.400$

(a) $a = b = c$ (b) $a > b > c$

(c) $a < b < c$ (d) can't say

2. Convert into fraction from.

(i) 0.2 (ii) 0.4

(iii) 0.50 (iv) 0.60

(v) 0.75 (vi) 0.33

(vii) 0.66 (viii) 0.25

(ix) 1.33 (x) 1.5

(xi) 4.33 (xii) 2.5

3. Find value of $\frac{1514}{489}$

(a) 3.096 (b) 3.000 (c) 2.879 (d) 3.414

4. If. $2.33 = \frac{x}{3}$, then find x.

5. (i) 12×0.67 (ii) 15×0.67

(iii) 0.125×24 (iv) 7.4×25

(v) 2.66×15 (vi) 8.75×8

(vii) 6×4.33 (viii) 25×0.6

(ix) 0.4×25 (x) 0.75×25

(xi) 0.67×12 (xii) 0.33×15

(xiii) 1.33×0.25

6. Find value of 3.87×0.4

(a) 1.584 (b) 1.548 (c) 3.851 (d) 1.845

7. Find value of given mathematical expression.

(i) $e^{-\infty}$ (ii) 3°

(iii) $\frac{1}{0.001}$ (iv) $\frac{6}{0.3}$

(v) $\sqrt{0.49}$ (vi) e^{0}

(vii) $\sqrt{1-0.19}$

8. Find value of given expression.

(i) $\left(\frac{5}{7}\right)^{5} \times \left(\frac{5}{7}\right)^{-6}$ (ii) $\left(\frac{64}{81}\right)^{3/2}$

(iii) $(4^{\circ} + 4^{-1}) \times 2^{2}$ (iv) $\frac{(-4)^{5}}{(-4)^{8}}$

(v) $\left(\sqrt{4}\right)^{-3}$ (vi) $\frac{0.4}{0.01}$

9. Find value of $0.25 \times \sqrt{0.49} \times (0.2)^{2}$

10. Find x:

(i) $\frac{4}{(1/x)} = 3$ (ii) $\frac{x}{(1/3)} = 4$ (iii) $\frac{x}{(1/y)} = 8$

11. If $\frac{A_1}{A_2} = -\frac{7}{3}$ then find $\frac{A_1 + A_2}{A_1 - A_2}$

12. If $\frac{\sqrt{I_1} + \sqrt{I_2}}{\sqrt{I_1} - \sqrt{I_2}} = \frac{5}{3}$ then find $\frac{I_1}{I_2}$.

Rules of Power

13. Find value of

(i) $10^2 + (10^3)$ = _____

(ii) $9^0 + 9$ = _____

(iii) $27 + 7^0$ = _____

(iv) $4^3 - 4^2$ = _____

(v) $3 - 1^2$ = _____

(vi) $(8)^{2/3}$ = _____

(vii) $(4)^{5/2}$ = _____

(viii) $(27)^{2/3}$ = _____

(ix) $t^2 t^3$ = _____

(x) $\frac{1}{x^2\sqrt{x}}$ = _____

(xi) $(27)^{1/3}$ = _____

(xii) $(9)^{5/2}$ = _____

14. Find value of $2^3 + 2^2 + 2^1$

(a) 64 (b) 16

(c) 14 (d) 32

15. Find x in given expansion:

(i) $(x)^{1/3} = 4$ (ii) $(x)^{2/3} = 9$

(iii) $(x)^{3/4} = 27$ (iv) $(x)^{3/2} = 8$

16. Simplified the following

(*i*) $(4)^{4/3} =$ (*ii*) $(64)^{2/5} =$

(*iii*) $(1/2)^{-3} =$ (*iv*) $(4)^{-3/2} =$

(*v*) $(2)^{-4} =$ (*vi*) $(125)^{2/3} =$

(*vii*) $(216)^{2/3} =$ (*viii*) $(64)^{2/3} =$

17. $8^x = 16$ find x

18. $\dfrac{3^9+3^9+3^9}{9^3}$

19. $\dfrac{9^2-9}{9}$

20. $x^3 = 27$ find x

21. $2^5 - 2^4$

22. $9^{x-7} = 9^{7-x}$ find x

23. $4 = \sqrt{\dfrac{x+4}{4}}$

24. $\dfrac{13^2-12^2}{13+12}$

25. $2x = \dfrac{12}{x^0+x^0}$

26. $(2^0-3)^2 - 1$

27. $(3^2-2^3)^2$

28. $\dfrac{21^2-21}{21}$

29. $2^x = 2^4 + 2^4$

30. $x^2 - x = 42$

31. $x^4 = 25^2$

32. $2^x = \dfrac{1}{8}$

33. $\dfrac{\sqrt{2}+\sqrt{2}}{\sqrt{2}}$

34. $\dfrac{x^2}{81} = \dfrac{9}{x}$

35. $\dfrac{9^{3/2}-6}{7}$

36. If $3^{6-x} = 27$, find value of x.

37. Find value of x in the following expression.

(*i*) $\left(\dfrac{4}{2}\right)^x = 8$ (*ii*) $(10)^{x/3} = 10^5$

(*iii*) $\dfrac{10^7}{10^{x/2}} = 10^6$ (*iv*) $x^{-\frac{2}{5}} = \dfrac{1}{9}$

38. If (x – 4)2/3 = 4. Find x.

39. Find value of x for given expression:

$27 = (5 + x^2)^{3/2}$

40. If rod of length l, is bended to form a coil of n-turns then find radius of coil.

41. There are n-sphere of radius r combine to form a big sphere of radius x then find its radius

42. Simplify the following expressions:

$(i)\ \sqrt{2}\times\sqrt{2}\ , (ii)\ \dfrac{2}{\sqrt{2}}, (iii)\ \dfrac{\sqrt{2}}{2}, (iv)\ \dfrac{12}{\sqrt{3}}, (v)\ \dfrac{24}{\sqrt{4}}$

43. Find value of $16^{-1/4} + 4^{-2}$?

44. Find value of n; if $\dfrac{2}{n} = 4 + \dfrac{6}{7}$.

45. If $x = \dfrac{d}{\sqrt{3}-1}$. Simplify this.

46. Take 2 common from the given expression:

(*i*) $(2 + x)^2$, (*ii*) $\sqrt{4+x}$

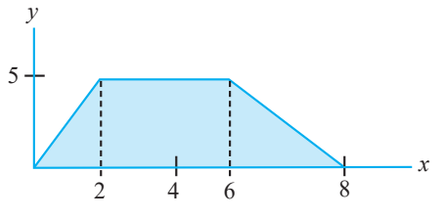
Area and Volume Related Questions

47. Find the ratio of area of cross section of cylinders to the volume of cylinder of radius R and height H.

48. Find area of equilateral triangle of side 'a'.

49. Find ratio of volume of cube to surface area of cube of side length a.

50. Find area of given graph.



Degree ⇌ Radian

51. Convert following radian into degree:

(*i*) $\dfrac{\pi}{2}$ rad (*ii*) $\dfrac{\pi}{4}$ rad (*iii*) $\dfrac{\pi}{3}$ rad

(*iv*) $\dfrac{5\pi}{6}$ rad (*v*) $\dfrac{2\pi}{3}$ rad (*vi*) $\dfrac{4\pi}{3}$ rad

(*vii*) $\dfrac{3\pi}{5}$ rad. (*viii*) 5π rad (*ix*) $\dfrac{2\pi}{5}$ rad

(*x*) $\dfrac{7\pi}{12}$ rad (*xi*) $\dfrac{5\pi}{2}$ rad (*xii*) 3π rad

(*xii*) $\dfrac{\pi}{6}$

52. Convert following into radian:

(*i*) 45°, (*ii*) 60°, (*iii*) 120°, (*iv*) 30°, (*v*) 150°, (*vi*) 90°, (*vii*) 300°, (*viii*) 270°, (*ix*) 135°, (*x*) 720°, (*xi*) 36°, (*xii*) 450°, (*xiii*) 440°, (*xiv*), 330°, (*xv*) 57°, (*xvi*) 360°

53. Total distance moved by object on the circle of Radius 5m in 3 and half Rotation

54. Convert 1 radian into minute?

55. Convert 2° in minute

56. When a clock shows 4 O'clock, how much angle do its minute and hour hand make.

57. **Fill in the Blank**

(*i*) 2 cm = _____ mm (*ii*) 4 nm = _____ mm

(*iii*) 4 μF = _____ PF (*iv*) 12 μF = _____ nc

(*v*) 12 kg = _____ mg (*vi*) 6 mg = _____ kg

(*vii*) 2 mg = _____ kg (*viii*) 4 μC = __ mc

(*ix*) 4 mm = _____ cm (*x*) 4 km = _____ mm

(*xi*) 20 μC = _____ nc (*xii*) 4 kg = _____ mg

58. $\dfrac{10^{19}}{10^2}$ = ...

(*a*) 10^{20} (*b*) 10^{21} (*c*) 10^{17} (*d*) 10^{22}

59. $50 \times 10^3\ kg =$ _____ $\times 10^4\ kg$

(*a*) 50 (*b*) 5

(*c*) 0.5 (*d*) 500

60. 80×10^{-6} kg $= 800 \times$ _____ kg

(*a*) 10^{-8} (*b*) 10^{-5}

(*c*) 10^{-6} (*d*) 10^{-7}

61. $10^{-8} \times 10^{-6} =$ _____

(*a*) 10^{-15} (*b*) 10^{-14}

(*c*) 10^{-3} (*d*) 10^{-2}

62. $8 \times 10^{-3}\ m =$ _____ $\times 10^{-2}\ m$

(*a*) 0.8 (*b*) 8

(*c*) 80 (*d*) 800

63. $5 \times 10^{-10}\ m =$ _____ $\times 10^{-8}\ m$

(*a*) 500 (*b*) 0.05

(*c*) 50 (*d*) 0.005

64. $100 \times 10^5\ m =$ _____ $\times 10^6\ m$

(*a*) 10 (*b*) 100

(*c*) 1000 (*d*) 0.1

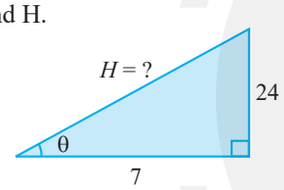
65. 1 fermi = _____ m

(*a*) $10^{-15}\ m$ (*b*) $10^{-10}\ m$

(*c*) $10^{-1}\ m$ (*d*) $10^{-18}\ m$

Trigonometry

66. Find angle θ and H.



67. **Assertion (A):** The value of sin θ can never be greater than one.

Reason (R): In a triangle, perpendicular is always smaller than Hypotenuse.

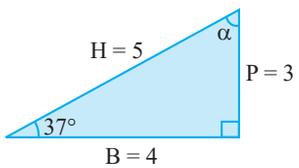
(*a*) Assertion (A) is false but Reason (R) is true.

(*b*) Both Assertion (A) and Reason (R) are true but Reason (R) is NOT the correct explanation of Assertion (A).

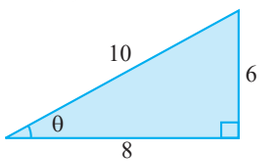
(*c*) Assertion (A) is true but Reason (R) is false.

(*d*) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

68. Find α:



69. For given triangle, find values of (*i*) sinθ (*ii*) cosθ (*iii*) tanθ (*iv*) secθ (*v*) secθ (*vi*) cotθ



70. If value of $\sin\theta = \frac{3}{4}$, then find value of cosθ and tanθ.

71. $\sin\theta = \frac{3}{5}$ then find cosθ, tanθ.

72. If tanθ = 2 then find sinθ and cosθ.

73. If $\sin\theta = \frac{4}{3}$ then find cos θ and tan θ.

74. Suggest suitable match between function given in the first column and its description given in the second column.

Column-I		Column-II	
(A)	sin (390°)	(P)	Positive
(B)	sin (–30°)	(Q)	Negative
(C)	cos 120°	(R)	Zero
(D)	tan (–120°)	(S)	Modulus is greater than one
		(T)	Modulus is less than one

(*a*) A → PT, B → QT, C → QT, D → PS

(*b*) A → PT, B → QS, C → QT, D → PS

(*c*) A → QT, B → QS, C → PT, D → PS

(*d*) A → QS, B → PT, C → QT, D → PS

75. If angle increases from 0° to 90°, then value sinθ and cosθ

(*a*) Increases, decreases (*b*) decreases, increases

(*c*) both decrease (*d*) both increase

76. Find value of sin (53°) × cosec (53°).

77. Find value of sin (180°) . cos(135°) . tan(120°).

78. Find value of x at θ = 90°. $\tan\theta = \frac{4}{x^2 - 4}$

79. If $y = \frac{\sin\theta}{\theta}$ then find value of y if θ = 30°.

80. Find value of sin2 (40°) + cos2 (40°).

81. Find value :

(*i*) sin 2° (*ii*) tan 3° (*iii*) cos 3°s (*iv*) sin (88.5°)

82. Which of the following option is correct for the value of tan (2°)

(*a*) 2° (*b*) $\frac{\pi}{90}$ (*c*) $\frac{\pi}{30}$ (*d*) 2 rad

83. Find value

(*i*) $\sin(A + B)$ (*ii*) $\sin(A - B)$

(*iii*) $\cos(A + B)$ (*iv*) $\cos(A - B)$

(*v*) $\tan(A + B)$

(*vi*) cos A• cos B – sin A• sin B

(*vii*) cos A• cos B + sin A • sin B

(*viii*) $\frac{\tan A + \tan B}{1 - \tan A \cdot \tan B}$

84. The value of sinθ. cosθ will be equal to half the value of sin (2θ)

(*a*) True (*b*) False

85. Find value of

(*i*) sin (75°) (*ii*) sin (105°) (*iii*) cos (120°)

86. Find value of

(*i*) sin (–30°) (*ii*) cos (–60°)
(*iii*) sin (120°) (*iv*) sin (390°)
(*v*) sin (360°) (*vi*) sin (450°)
(*vii*) sin (–90°) (*viii*) sin (–150°)
(*ix*) cos (300°) (*x*) cos (330°)
(*xi*) tan (240°) (*xii*) cos (–30°)
(*xiii*) tan (–60°) (*xiv*) cot (–45°)

87. If y = A sin θ + B cos θ then find maximum value of y.

88. If y = 3 cos θ + 4 cos θ then find maximum value of y.

89. Find the maximum and minimum values of the following trigonometric functions:

$Y = 3 \sin(2\theta)$

$Y = 3 \sin\theta + 4 \cos\theta$

$Y = 5 \sin\theta + 4 \cos\theta$

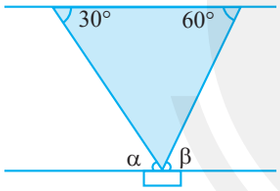
$Y = 5 - 3 \sin(2\theta)$

90. Match the following trigonometric function with its corresponding maximum and minimum values

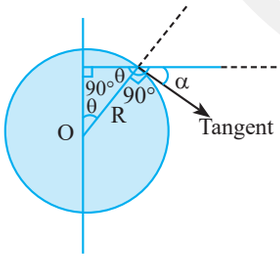
Trigonometric function	Maxima and Minima values
(*i*) y = 3 sin θ + 4 sin θ	(A) $y_{max} = +7, y_{min} = +3$
(*ii*) y = 4 sin (5θ)	(B) $y_{max} = +7, y_{min} = -7$
(*iii*) y = 5 – 2 sin θ	(C) $y_{max} = +4, y_{min} = -4$
(*iv*) y = 6 sin θ + 8 cos θ	(D) $y_{max} = +10, y_{min} = -10$

91. If $y = 3 \cos(3\theta)$, then find angle at which y will be zero.

92. Find α & β

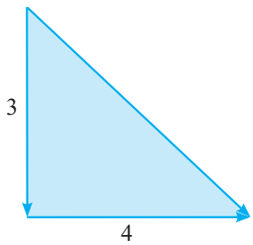


93. Find relation between θ and α



(*a*) α = 90° – θ (*b*) α = 90°
(*c*) α = θ (*d*) α = 90 + θ

94. Find the angle between the hypotenuse and the *x*-axis.



Phasor

95. Find the phase difference between A and B in the following cases:

(*i*) A = 4 sin (θ + π/4) B = 3 sin (θ – π/4)
(*ii*) A = 4 sin (θ + π/3) B = 3 sin (θ + π/6)
(*iii*) A = 3 cos (ω*t* + π/2) B = 3 sin (ωt)
(*iv*) A = 3 sin (ω*t*) B = 3 cos (ωt – π/2)

96.

Equation-1	Equation-2	Phase Difference	Resultant
$I_1 = I_0 \sin(\theta + \pi/3)$	$I_2 = I_0 \sin(\theta - \pi/6)$		
$I_1 = I_0 \sin(\theta + \pi/3)$	$I_2 = I_0 \cos(\theta + \pi/3)$		
$I_1 = 4 \sin(\omega t)$	$I_2 = 4 \cos(\omega t + /6)$		
$I_1 = 3 \sin(\omega t + \pi/2)$	$I_2 = 5 \cos(\omega t)$		
$I_1 = 4 \cos(\omega t - /2)$	$I_2 = 4 \sin(\omega t + \pi/2)$		
$I_1 = 3 \sin(\omega t + \pi/6)$	$I_2 = 3 \cos(\omega t)$		
$I_1 = 4 \sin(\theta - 60°)$	$I_2 = 4 \cos(\theta - 30°)$		

97. Equation of a.c. Current I = –I0 cos (ωt) and a/c voltage is V = V0 sin (ωt – π/6) then phase difference between current and voltage:

(*a*) $\frac{2\pi}{3}$ (*b*) $\frac{\pi}{3}$ (*c*) $\frac{\pi}{6}$ (*d*) $\frac{5\pi}{6}$

98. Current in A/C circuit is I1 = I0 sin (ωt– 30°) and voltage across it $V = V_o \cos(\omega t)$.

99. Equation of Two oscillatory particle x_1 4 sin (ωt) x_2 = 3 Cos (ωt) find equation of Superimposed SHM.

100. Equation of current and voltage

$I = 10 \sin\left(\theta + \frac{\pi}{3}\right)$ and $V = 10 \cos\left(\theta - \frac{\pi}{6}\right)$

then phase difference between current and voltage.

101. If $y_1 = 2 \sin(5\pi t)$ and $y_2 = 2 \cos(5\pi t - \pi/3)$, what is the phase difference between the two waveforms?

102. Two waves are represented by the equations $y_1 = 4 \sin(3t)$ and $y_2 = 4 \sin(3t + \pi/2)$. Determine the phase difference between the two waves.

103. The equation of two waves are given as $y_1 = 3 \sin(4\pi t)$ and $y_2 = 3 \cos(4\pi t + \pi/3)$. Determine the phase difference between the two waves.

104. If $y_1 = 4 \sin(\omega t - \pi/6)$ and $y_2 = 4 \sin(\omega t + \pi/6)$, what is the phase difference between the two waveforms?

A.P series and G.P Series

105. Which of the following series is not arithmetic progression.

(*a*) 2, 8, 15, 21, 27, ...(*b*) 3, 6, 12, 24, ...

(*c*) 4, 1, –2, –5, –8, ...(*d*) –5, –3, –1, 1, ...

106. Find 10th term and sum of 1st 10 term.

7, 11, 15, 19, __, __, __, __, __

107. Sum of 1st n-natural number 1 + 2 + 3 + ... n.

(*a*) $\frac{n^2}{2}$ (*b*) $\frac{n(n+1)}{2}$ (*c*) $\frac{n(n-1)}{2}$ (*d*) $\frac{n^2(n+1)}{6}$

108. Which term of AP 27, 24, 21, ... is zero.

109. 28, 22, x, y, 4 is an AP then value of x and y is:

110. 25 tuning fork are arranged in increasing order of frequency. Frequency difference is 10 then find frequency of 1st turning fork if frequency of 25th is 400 Hz.

111. **Assertion (A) :** Geometric progression is a type of sequence where each successive term is produced by multiplying each preceding term by common ratio.

Reason (R) : Sum of G.P. Series is given by $\frac{1\text{st term}}{1-\text{C.R.}}$ for any value of C.R. [Common Ratio]

(*a*) Assertion (A) is false but Reason (R) is true

(*b*) Both Assertion (A) and Reason (R) are true but Reason (R) is NOT the correct explanation of Assertion (A).

(*c*) Assertion (A) is true but Reason (R) is false.

(*d*) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

112. Find potential at origin?

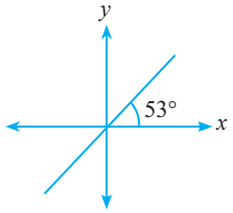
	+q	–q	+q	–q	+q	–q
(0, 0)	(1, 0)	(2, 0)	(4, 0)	(8, 0)	(16, 0)	(32, 0)

113. 5- Resistance connected in series, resistance of each..... is half of previous resistance if 1st resistance of value 10Ω then value of 5th resistance.

114. Charge q is placed on *x*-axis of co-ordinate (1, 0), (2, 0), (4, 0), (8, 0) and so on then find force on charge q_0 which is at origin.

Graph Related Questions

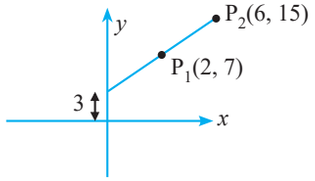
115. *x-y* equation for the graph given below is



(*a*) $y=\frac{4}{3}x$ (*b*) $y=-\frac{4}{3}x-4$

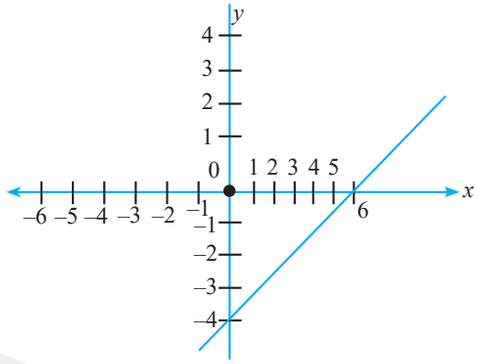
(*c*) $y=\frac{5}{3}x$ (*d*) $y=\frac{4}{5}x$

116. *x-y* equation for the graph given below is:



(*a*) $y = x + 3$ (*b*) $y = 2x + 3$ (*c*) $y = 2x - 3$ (*d*) $y = 2x$

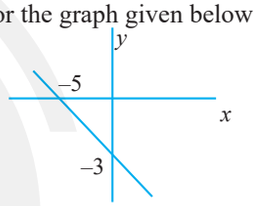
117. *x-y* equation for the graph given below is



(*a*) $2y - 3y = 12$ (*b*) $x - 3y = 12$

(*c*) $2x - y = 12$ (*d*) None

118. *x-y* equation for the graph given below is

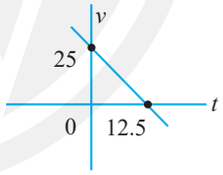


(*a*) $3x - 5y = 15$ (*b*) $-3x - 5y = 15$

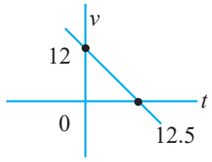
(*c*) $x - 5y = 15$ (*d*) $3x + 5y = 15$

119. A particle starts moving with initial velocity $u = 25 m/s$ and retardation $a = -2 m/s^2$, draw the velocity time graph

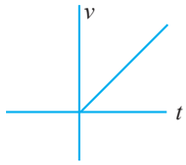
(*a*)



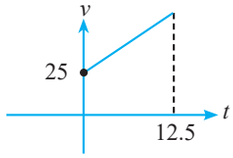
(*b*)



(*c*)



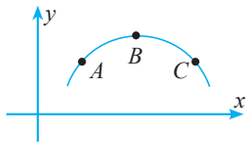
(*d*)



120. Find the slope of given equation $2x - 3y = 12$

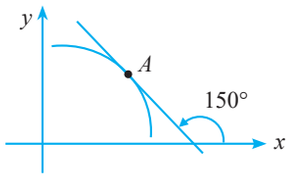
(*a*) $\frac{3}{2}$ (*b*) $\frac{2}{3}$ (*c*) $\frac{4}{3}$ (*d*) $\frac{8}{3}$

121. Find slope at point *B*.



(*a*) +ve (*b*) –ve (*c*) Zero (*d*) None

122. Find slope at point 'A'



(*a*) $-\frac{1}{\sqrt{3}}$ (*b*) $\frac{1}{\sqrt{3}}$ (*c*) 1 (*d*) Zero

123. Find the value of l, so that 2 is the slope of the line through (2, 5), and (λ, 3)

(*a*) $\lambda = 2$ (*b*) $\lambda = 3$ (*c*) $\lambda = 1$ (*d*) None

124. Find the slope of the line through the points (4, – 6), (–2, –5)

(*a*) $-\frac{1}{5}$ (*b*) $-\frac{1}{6}$ (*c*) $\frac{1}{7}$ (*d*) $\frac{1}{8}$

125. What is the nature of graph for the equation $y = 2x^2$

(*a*) Straight line (*b*) Hyperbola
(*c*) Parabola (*d*) Ellipse

126. What is the nature of graph for the equation $y = -4x^2 + 6$

(*a*) Parabola passing through origin
(*b*) Parabola not passing through origin
(*c*) Hyperbola
(*d*) Straight line

127. Nature of the graph for equation $y = 6e^{-4x}$ is

(*a*) Exponentially decreasing graph
(*b*) Exponentially increasing graph
(*c*) Straight linle
(*d*) None of these

128. Nature of graph for equation $y = \frac{4}{x}$ is :

(*a*) Rectangular hyperbola (*b*) Exponential
(*c*) Parabola (*d*) Straight line

129. What is the radius of the circle

$(x + 2)^2 + (y - 3)^2 = 5^2$

(*a*) 5 (*b*) +2 (*c*) 3 (*d*) 25

130. In above problem, what is the x-coordinate of the centre of the circle

(*a*) –2 (*b*) +2 (*c*) 4 (*d*) –9

131. In Q.129, what is the y-coordinate of the centre of the circle:

(*a*) 3 (*b*) –3 (*c*) 9 (*d*) –9

132. If the radius of a circle is 2 and its centre at origin then equation of the circle is :

(*a*) $x^2 + y^2 = 4$ (*b*) $x^2 + y^2 = -4$
(*c*) $(x - 2)^2 + (y - 2)^2 = 2^2$ (*d*) $(x + 2)^2 + (y + 2)^2 = 2^2$

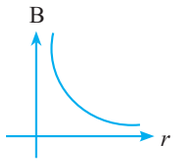
133. A straight line passing through (3, –2) and (7, –2) then it's slope is:

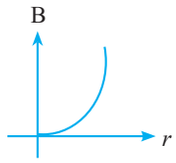
(*a*) 1 (*b*) –1 (*c*) 0 (*d*) None

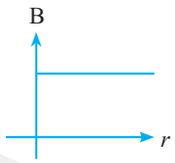
134. Equation of the circle of centre (0, 2) and radius 2 is :

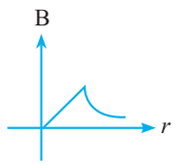
(*a*) $(x - 0)^2 + (y + 2)^2 = 2^2$
(*b*) $(x - 0)^2 + (y - 2)^2 = 2^2$
(*c*) $(x - 0)^2 + (y + 2)^2 = 2$
(*d*) $(x - 0)^2 + (y - 2)^2 = 2$

135. Magnetic field due to infinite current carrying wire and $B = \frac{\mu_0}{4\pi}\frac{2I}{r}$. Then draw the graph between B and r.

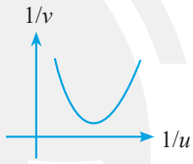
(*a*) 

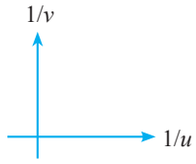
(*b*) 

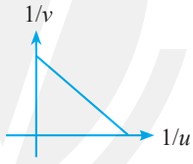
(*c*) 

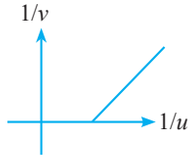
(*d*) 

136. For a concave mirror, if read image is formed the graph between $\frac{1}{u}$ and $\frac{1}{v}$ is of the form.

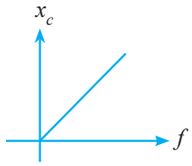
(*a*) 

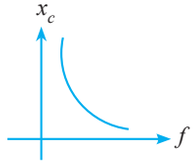
(*b*) 

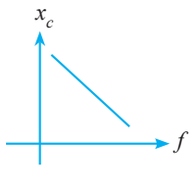
(*c*) 

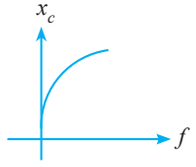
(*d*) 

137. Which of the following curve correctly represents the variation of capacitive reactance x_c with frequency. $\left(x_c = \frac{1}{2\mu fc}\right)$

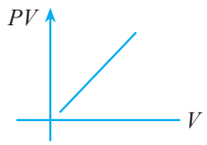
(*a*) 

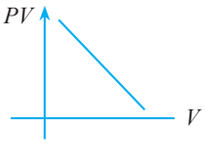
(*b*) 

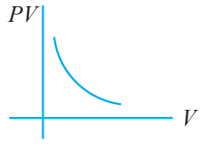
(*c*) 

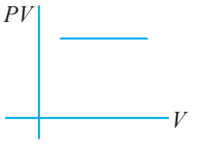
(*d*) 

138. Which one of the following graphs represents the behaviour of an ideal gas. (T = constant)

(a) 

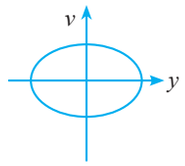
(b) 

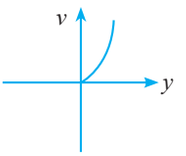
(c) 

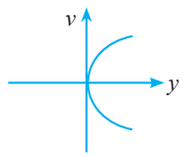
(d) 

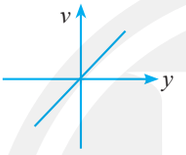
139. A particle performing SHM with velocity $V = \omega\sqrt{A^2 - y^2}$ where

A = Amplitude then row graph between velocity (v) and position (y).

(a) 

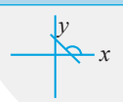
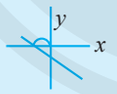
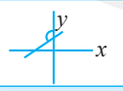
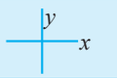
(b) 

(c) 

(d) 

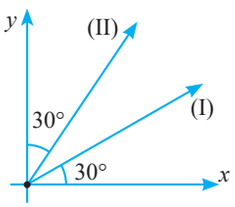
Coordinate Geometry: Straight Line

140. Match the following:

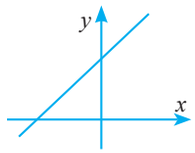
Column-I		Column-II	
(1)	Positive slope with negative y intercept	(A)	
(2)	Negative slope with negative y intercept	(B)	
(3)	Positive slope with positive y intercept	(C)	
(4)	Negative slope with positive intercept	(D)	

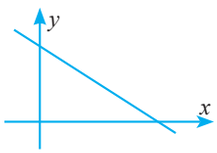
141. Find equation of a straight line passing through point (3, 4) and (2, 6).

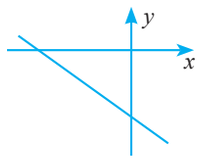
142. Find $\frac{(\text{slope})_I}{(\text{slope})_{II}} =$

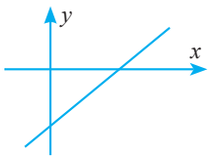


143. Comment on slope and intercept.

(a) 

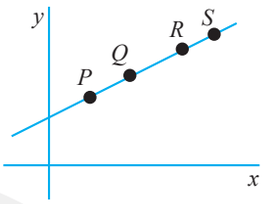
(b) 

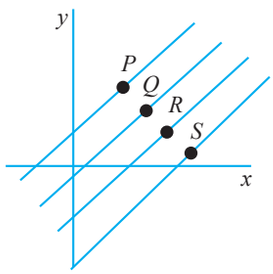
(c) 

(d) 

144. Draw graph having Y-intercept 4 and passing through (2, 6).

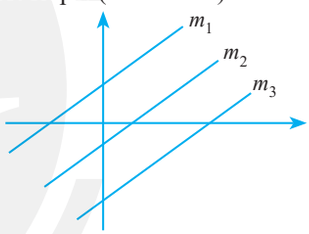
145. Relation between slop in both the graph at P, Q, R, S



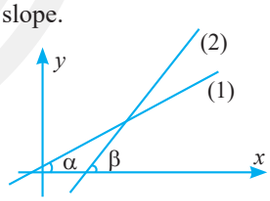


(a) $m_P < m_Q < m_R < m_S$ (b) $m_P = m_Q = m_R = m_S$
(c) $m_P > m_Q > m_R > m_S$ (d) $m_P < m_Q = m_R > m_S$

146. In this given graph m_1 is having highest slope while m_3 is having lowest slope. (True/False)



147. Comment on slope.

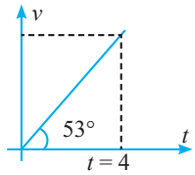


148. If A = –2 and initial value of y is 10 and x is 0 then what will be the value of x intercept in the graph of y v/s x if A = $\frac{dy}{dx}$.

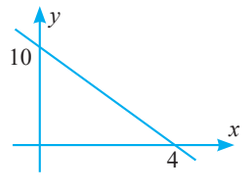
149. Find equation of the line which makes intercept +4 and 5 on the x and y-axis respectively.

(a) $5x + 4y + 20 = 0$ (b) $4y + 5x - 20 = 0$
(c) $4y - 5x = -20$ (d) $4x + 5x + 20 = 0$

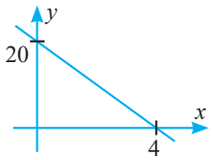
150. Find the velocity of an object at t = 4 seconds using the given velocity-time graph.



151. The graph of a line is shown with a y -intercept of 10 and passing through the point (4,0). Find:
The slope of the graph.
The value of y when x = 2.



152. Find slope and value of y at $x = 8$.



153. If equation of straight line is given as $3y = 4x + 2$, then find the value of sin θ if θ is angle made by that straight line with respect to x axis.

Ellipse

154.

Equation	Nature of Graph
(*i*) $x^2 + y^2 + 25$	(A) Parabola
(*ii*) $\frac{x^2}{4}+\frac{y^2}{3}=16$	(B) Rectangular hyperbola
(*iii*) x^2y = constant	(C) Ellipse
(*iv*) $5 = y^2 x^{-1}$	(D) Circle
(*v*) $4x + 3y = 25$	(E) Straight line
(*vi*) $y = 4 \sin \theta$	(F) Sinusoidal

155. $y = 2x + 4$ find change in y with respect to x when x changes from $\frac{x_1 = 1}{x}$ to $\frac{x_2 = 3}{x}$

156. If $Y = 2x + 4$, find rate of change in y with respect to x

Draw Graph

157. $y = x^2 - 4$ **158.** $y = -(x^2)$

159. $y = x^2 + 5$ **160.** $y = -x^2 + 4$

161. If $y = 2^x$ Draw graph *b/w* y and x

162. $(x - 4)^2 + (y - 3)^2 = 25$ Find radius and centre of circle.

163. The equation of the ellipse whose vertices are at (± 5, 0) and foci at (± 4 ,0) is

(*a*) $\frac{x^2}{25}+\frac{y^2}{9}=1$ (*b*) $\frac{x^2}{9}+\frac{y^2}{25}=1$

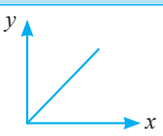
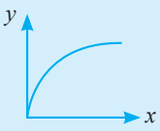
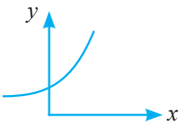
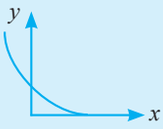
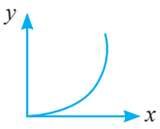
(*c*) $\frac{x^2}{10}+\frac{y^2}{25}=1$ (*d*) $\frac{x^2}{25}+\frac{y^2}{16}=1$

164. Draw graph between y and x for given equation:

(*a*) $y = \sqrt{3}x + 4$ (*b*) $y = -x$

(*c*) $y = x$ (*d*) $\frac{x}{3}+\frac{y}{4}+1=0$

165. Match the following :

	Column-I		Column-II
(*i*)	$y^3 = 5x^2$	(A)	
(*ii*)	$3y = 4x$	(B)	
(*iii*)	$y = e^{-x}$	(C)	
(*iv*)	$y^2 = 7x^4$	(D)	
(*v*)	$y = e^x$	(E)	

166. Match the following

Graph between physical quantity		Nature of graph	
(*i*)	Electric field and distance for dipole	A.	Straight line
(*ii*)	Velocity and acceleration for oscillating particle	B.	Parabola
(*iii*)	Force and distance for spring & S.H.M.	C.	Ellipse
(*iv*)	Displacement and time for motion under gravity	D.	Circle
(*v*)	Gravitational potential & distance for solid sphere	E.	Rectangular hyperbola
(*vi*)	Time period and radius of satellite	F.	Parabola + Rectangular hyperbola
(*vii*)	Velocity and position for SHM having unit angular frequency		
(*viii*)	Pressure Volume for isothermal process		
(*ix*)	Mass rise in capillary tube and radius		
(*x*)	De-Brogliee wavelength momentum		

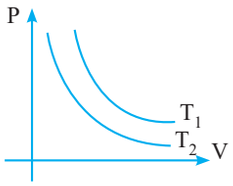
167. Draw graph between momentum and velocity P = mV.

168. Draw graph between spring force and elongation.

169. Draw graph between stopping potential V0 and energy of photon for given equation $E = \phi + eV0$.

170. $\frac{C-0}{100-0} = \frac{K-273}{373-273}$

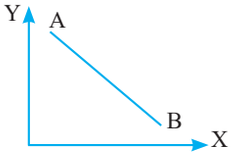
171. Which of the following option is correct ?



(*a*) $T_1 = T_2$ (*b*) $T_1 > T_2$ (*c*) $T_1 < T_2$ (*d*) Can't say

172. If y/x graph's slope gives the value of temperature, then T is increasing and then decreasing if we move from A to B.

(*a*) True (*b*) False



173. De-Broglie wavelength $\lambda = \frac{h}{P}$. Draw graph between wavelength and momentum.

174. If temperature is constant then draw graph between pressure and volume for constant temperature.

175. We know K.E. and momentum relation $P = \sqrt{2m\,K.E}$. Draw graph between P and K.E.

176. Time period of simple pendulum $T = 2\pi\sqrt{\frac{l}{g}}$ draw graph b/w time period and length

177. **Assertion (A) :** In SHM, if velocity of particle is given by $v = \omega = \sqrt{A^2 - x^2}$. Then graph between velocity and displacement *x* will be elliptical

Reason (R) : In SHM graph between K.E. and P.E. will be straight line.

(*a*) Assertion (A) is false but Reason (R) is true.

(*b*) Both Assertion (A) and Reason (R) are true but Reason (R) is NOT the correct explanation of Assertion (A).

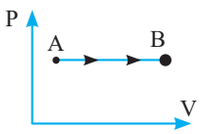
(*c*) Assertion (A) is true but Reason (R) is false.

(*d*) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

178. **Assertion (A) :** In the given P-V graph shown, work done is continuously increasing if we move from A to B.

[**Hint :** $\Sigma W = SP \cdot dv$]

Reason (R) : The slope of graph is zero.



(*a*) Assertion (A) is false but Reason (R) is true.

(*b*) Both Assertion (A) and Reason (R) are true but Reason (R) is NOT the correct explanation of Assertion (A).

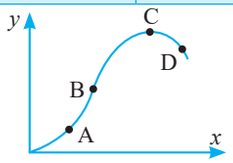
(*c*) Assertion (A) is true but Reason (R) is false

(*d*) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

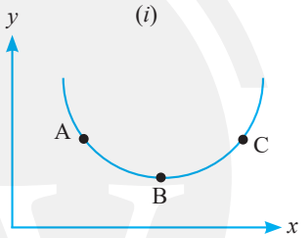
Slope of Curve

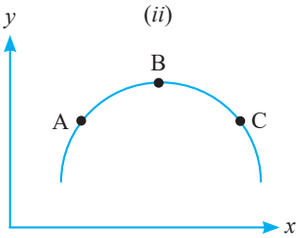
179. Match the matrix:

Point	Slope
A	Zero
B	Negative
C	Maximum
D	Positive

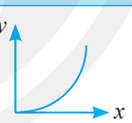
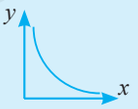
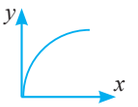
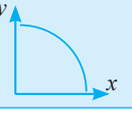


180. Comment on slope and variation of slope.





181. Match the following:

	Column-I		Column-II
(1)		(A)	The value of slope is decreasing and also its magnitude is decreasing.
(2)		(B)	The value of slope decreasing but it's magnitude is increasing.
(3)		(C)	Value and magnitude of slope both are increasing.
(4)		(D)	Slope is increasing but it's magnitude decreasing.

Quadratic Equation

182. Find roots of the equation : $x^2 - 5x + 6 = 0$.

183. $x^2 - 4x = 0$, find roots of the equation.

184. $x^2 + 7x + 12 = 0$ find roots of 'x'

185. $2t^2 + 3t - 2 = 0$, find roots of equation.

186. Roots of equation $x^2 - 4x + 3 = 0$

(*a*) 1, 3 (*b*) –1, 3 (*c*) 1, –3 (*d*) –1, –3

187. Roots of equation $x^2 - x - 1 = 0$

(*a*) $\frac{1+\sqrt{5}}{2}, \frac{1-\sqrt{5}}{2}$ (*b*) $\frac{1+\sqrt{5}}{2}, \frac{\sqrt{5}-1}{2}$

(*c*) $\frac{-1+\sqrt{5}}{2}, \frac{-1-\sqrt{5}}{2}$ (*d*) None of these

188. Solve these quadratic equations and find the roots.

(*i*) $X^2 - 5x - 14 = 0$ (*ii*) $X^2 = 11x - 28$

(*iii*) $6x^2 - x = 5$ (*iv*) $12x^2 = 25x$

(*v*) $x^2 + 4x - 5 = 0$

189. Find roots of equation.

(*i*) $x^2 - 7x + 10 = 0$ (*ii*) $2x^2 - 5x + 3 = 0$

190. Find roots of equation.

(*i*) $2x^2 - 5x - 3 = 0$ (*ii*) $x^2 - 5x + 6 = 0$

Logarithm

191. $\log_{10} 1 = ?$

(*a*) 1 (*b*) –1 (*c*) 0 (*d*) None

192. $\log_2 (\sin 90°) = ?$

(*a*) 1 (*b*) –1 (*c*) 0 (*d*) None

193. $\log_8 (16) = ?$

(*a*) 4/3 (*b*) 3/2 (*c*) 2/3 (*d*) 3/4

194. $\log_9 (27) = ?$

(*a*) 4/3 (*b*) 3/2 (*c*) 2/3 (*d*) 3/4

195. $\log_{100} (1000) = ?$

(*a*) 4/3 (*b*) 3/2 (*c*) 2/3 (*d*) 3/4

196. $\log_2 (10) = ?$

(*a*) 0.3 (*b*) 3.33 (*c*) 6.67 (*d*) 5

197. $\log_2 3 = ?$

(*a*) 1.6 (*b*) 0.8 (*c*) 0.6 (*d*) 2.6

198. If $\log_2 x = 3$, then $x = ?$

(*a*) 6 (*b*) 8 (*c*) 9 (*d*) None

199. If $\log_3 (y^2) = 4$, then $y = ?$

(*a*) 9 (*b*) 81

(*c*) –9 (*d*) Both (*a*) and (*c*)

200. $\log_{10} (4) = ?$

(*a*) 2 (*b*) 0.6020 (*c*) 0.9542 (*d*) None

201. $\log_4 (2) = ?$

(*a*) 2 (*b*) –2 (*c*) 1/2 (*d*) –1/2

202. $\log_{16} (2) = ?$

(*a*) 4 (*b*) –4 (*c*) –1/4 (*d*) 1/4

203. $\log_{10} (x^2 - 4x + 4) = 0$, then $x = ?$

(*a*) 1 (*b*) 2

(*c*) 3 (*d*) Both (*a*) and (*c*)

204. $\log_{10} 5 + \log_{10} 2 = ?$

(*a*) 1 (*b*) 2 (*c*) –2 (*d*) 3

205. $\log_{10} (200) - \log_{10} 2 = ?$

(*a*) 1 (*b*) 2 (*c*) –2 (*d*) 3

206. $\log_{10} 50 + \log_{10} 6 - \log 10\ 3 = ?$

(*a*) 1 (*b*) 2 (*c*) –2 (*d*) 3

207. $\log_{10} (6) = ?$

(*a*) 0.48 (*b*) 0.30 (*c*) 0.78 (*d*) 0.18

208. $\log_{10} (5) = ?$

(*a*) 1 (*b*) 0.30 (*c*) 0.70 (*d*) 1.30

209. $\log_e (2) = ?$

(*a*) 0.3010 (*b*) 0.693

(*c*) 1/0.693 (*d*) 1/0.3010

210. Find value of given log.

(*i*) $\log_{\frac{1}{\sqrt{2}}} \left(\frac{1}{\sqrt{8}}\right)$ (*ii*) $\log_x \left(\frac{9}{10}\right) = -\frac{1}{2}$ find x

(*iii*) $\log 9^{27} - \log 27^9$

211. Which of the following statement is not correct

(*a*) $\log_{10} 10 = 1$

(*b*) $\log (2 + 3) = \log (2 \times 3)$

(*c*) $\log_{10} 1 = 0$

(*d*) $\log (1 \times 2 \times 3) = \log 1 + \log 2 + \log 3$

212. $\log_{10} e^{25} + \log_{10} e^4 - \log_{10} e^{10}$

213. Find value of given expression : $\log_{10} (4 \times 10^{-4})$

214. Find value of x. In the given expression:

(*i*) $\log_2 x = -4$, (*ii*) $\log_3 x^2$

215. Solve

(*i*) $\log_{10} (\sin \theta \cdot \text{cosec}\ \theta)$ (*ii*) $\log_{10} 25 + \log_{10} 40$

(*iii*) $\log_{10} 200 - \log_{10} 2$ (*iv*) $\log_{10} 200$

216. Loudness of sound at a point in 50 dB then find intensity at that point if $L = 10 \log_{10} \left(\frac{I}{I_0}\right)$ dB, where $I0 = 10^{-12}$ w/m^2.

(*a*) 10^{-7} w/m^2 (*b*) 10^{-5} w/m^2

(*c*) 10^{8} w/m^2 (*d*) 10^{7} w/m^2

217. Loudness at a point is 16 dB where intensity is 1 then find loudness at a point where intensity is 1/4

where, $L = 10 \log_{10} \left(\frac{1}{I_0}\right) dB$

218. If current flowing through wire is $I = 20\ e^{-\lambda t}$, find the time when current becomes 10 Amp. Where λ is 2.303.

Differentiation

219. What is the derivative of the function $f(x) = 5x^2 + 3x - 2$?

(a) $5x^2 + 3x^2 - 2x$ (b) $10x + 3$
(c) $10x + 3x - 2$ (d) $10x - 3$

220. Find the derivative of the function $f(x) = 3 \sin(x) + 2 \cos(x)$.

(a) $3 \cos(x) - 2 \sin(x)$ (b) $3 \cos(x) + 2 \sin(x)$
(c) $3 \sin(x) - 2 \cos(x)$ (d) $-3 \cos(x) + 2 \sin(x)$

221. Find the derivative of the function $f(x) = x^3 - 4x^2 + 2x - 1$.

(a) $3x^2 - 8x + 2$ (b) $3x^2 - 8x$
(c) $3x^3 - 8x^2 + 2x$ (d) $3x^2 - 4x + 2$

222. Area of a ink spot with respect to time is $A = (3t^2 + 7)\ cm^2$ then find the increasing rate in area at $t = 5$ second.

(a) 60 cm^2s^1 (b) 15 cm^2s^1
(c) 30 cm^2s^1 (d) 90 cm^2s^1

223. Area of a circle is $A = \pi r^2$, where r is radius, then find the increasing rate of area with respect to radius:

(a) $2\pi r$ (b) πr^2 (c) 2π (d) πr

224. A balloon is being inflated such that its volume is increasing at a rate of 10 cubic centimeters per second. How fast is the radius of the balloon increasing when the radius is 5 centimeters?

(a) $1/10\pi$ cm/s (b) 2/5 cm/s
(c) 1 cm/s (d) 2 cm/s

225. The side of a square is increasing at a rate of 2 centimeters per second. How fast is the area of the square increasing when the side is 10 centimeters?

(a) 20 cm^2/s (b) 40 cm^2/s (c) 60 cm^2/s (d) 80 cm^2/s

226. A particle moves along a straight line with a velocity function $v(t) = t^2 - 3t$, where t is the time in seconds. When is the particle at rest?

(a) $t = 0$ and $t = 3$ (b) $t = 0$ and $t = 2$
(c) $t = 1$ and $t = 3$ (d) $t = 1$ and $t = 2$

227. The displacement of an object is given by $s(t) = 3t^2 - 4t + 2$. What is its acceleration at $t = 1$?

(a) 2 m/s^2 (b) 4 m/s^2 (c) 6 m/s^2 (d) 8 m/s^2

228. The displacement of a particle is given by $x(t) = 4t^3 + 3t^2 - 6t + 1$. What is its velocity at $t = 2$?

(a) 41 m/s (b) 3 m/s (c) 54 m/s (d) 21 m/s

229. If the position of an object is given by $x(t) = 2e^t + 5$, what is its velocity?

(a) $2e^t$ (b) $2e^t + 5$ (c) e^t (d) $e^t + 5$

230. What is the derivative of the function $f(x) = 4x^3 + 2x^2 - 7x + 9$ with respect to x?

(a) $g'(x) = 12x^2 + 4x - 7$ (b) $g'(x) = 12x^3 + 2x^2 - 7$
(c) $g'(x) = 4x^2 + 2x - 7x + 9$ (d) $g'(x) = 4x^4 + 2x^3 - 7x^2 + 9$

231. What is the derivative of the function $f(x) = \ln(x^2 + 1)$?

(a) $\dfrac{2x}{(x^2+1)}$ (b) $\dfrac{2x}{(x^2-1)}$
(c) $\dfrac{(x^2+1)}{(2x)}$ (d) $\dfrac{(x^2-1)}{(2x)}$

232. Determine the derivative of the function $f(x) = e^{(2x+1)}$

(a) $2e^{(2x+1)}$ (b) $(2x + 1)\, e^{(2x+1)}$
(c) $e^{(2x+1)}$ (d) $e^{(2x)}$

233. If $y = 4e^{x^2-2x}$ then $\dfrac{dy}{dx}$ will be:

(a) $(8x - 8)e^{x2-2x}$ (b) $(2x - 2)e^{x2-2x}$
(c) $(8x - 8)e^{2x-x}$ (d) None

234. If $y = t^2$ and $x = 2t$ then find $\dfrac{dy}{dx}$

(a) t (b) $\dfrac{x}{2}$
(c) Zero (d) Both (a) and (b)

235. If $y = 2\sin(\omega t + \phi)$, where ω and ϕ are constant then which of the following is correct.

(a) $\dfrac{d^2y}{dt^2} = -\omega^2 y$ (b) $\dfrac{d^2y}{dt^2} = +\omega^2 y$
(c) $\dfrac{d^2y}{dt^2} = +\omega y$ (d) $\dfrac{d^2y}{dt^2} = -\omega^2 y^2$

236. If $y = \sin\theta$ and $x = \cos\theta$ then find $\dfrac{dx}{dy}$

(a) $\tan\theta$ (b) $-\tan\theta$ (c) Zero (d) 1

237. If $y = \tan x.\ \cos^2 x$ then find $\dfrac{dx}{dy}$

(a) $1 + 2\cos^2 x$ (b) $2\sin^2 x$
(c) $\sin^2 x - \cos^2 x$ (d) $1 - 2\sin^2 x$

238. Find $\dfrac{d\left(\dfrac{\sin x}{\cos x}\right)}{dx}$

(a) $\tan x$ (b) $\sec^2 x$ (c) $\sin x.\cos x$ (d) $-\dfrac{\cos x}{\sin x}$

239. If $U = \dfrac{A}{x^5} = \dfrac{B}{x^6}$ find x where $\dfrac{du}{dx} = 0$

(a) $\dfrac{6B}{7A}$ (b) $\dfrac{6B}{5A}$ (c) $\dfrac{6A}{5B}$ (d) $\dfrac{7B}{6A}$

240. If $u = x^2yz + y^2xz + z^2xy$ then find partial differential of u w.r.t. x

(a) $2xyz + y^2z + z^2y$ (b) $x^2y + y^2z + z^2x$
(c) $2xyz + 2yxz + 2zxy$ (d) None of these

241. Equation of curve $y = \sin x$ then find its slope at (0, 0)

(a) 0 (b) 1 (c) $\propto$ (d) None

242. Find maximum or minimum values of the function $y = 25x^2 + 5 - 10x$

(a) $y_{min} = 4$ (b) $y_{max} = 4$ (c) $y_{min} = 5$ (d) $y_{min} = -4$

243. If $y = x \cos x$, then find $\frac{dy}{dx}$ at $x = \pi$

(*a*) –1 (*b*) 1 (*c*) 0 (*d*) $\frac{1}{2}$

244. If $\frac{dy}{dx} = 0$ then y is ?

(*a*) Zero (*b*) Variable

(*c*) Constant (*d*) Non-zero number

245. If $A = \frac{dy}{dx}$, then A must be zero if y is not changing with respect to *x*.

(*a*) True (*b*) False

246. $y = x^2 - 4x + 3$, then find value of $\frac{dy}{dx}$ at $x = 2$

247. $y = x(2 - x^2)$ then find $\frac{dy}{dx}$ (?)

248. $y = \sqrt{x} + \frac{1}{\sqrt{x}}$

249. $y = \left(\sqrt{x} + \frac{1}{\sqrt{x}}\right)^2$

250. Fill in the blanks :

- Product of slope of two straight line is –1 then these straight line must be _____ to each other.
- If $y = \pi \sin \theta$, find value of *y* at $\theta = 4°$.
- If $y = \pi \cos \theta$, find value of *y* at $\theta = 5°$.
- Differentiation of potential energy with position is called_____

251. The differentiation of sin ($\pi/2$) will be cos($\pi/2$).

(*a*) True (*b*) False

252. Differentiate $y = \tan x \cdot \log x$.

253. Differentiate, $y = \cos x + \frac{2}{x^3}$.

254. Differentiate $y = \frac{4}{(x^3 + 1)}$

255. Differentiation of following function:

(*i*) $y = x^2 \cos x$ (*ii*) $y = \sin(2x^2)$

(*iii*) $y = A \sin(wt + 5)$ (*iv*) $y = (x - 4x^2)^3$

(*v*) $y = \sin 50x$ (*vi*) $y = \frac{x^2}{x^2 - 4}$

(*vii*) $y = \frac{4}{(x^2 - 4)}$ (*viii*) $y = \sqrt{x^2 + 5}$

256.

	Physical Quantity	Differentiation of Physical (quantity Slope)
1.	Potential energy w.r.t. distance	
2.	Velocity w.r.r. time	
3.	Gravitational potential w.r.t. distance	
4.	Angular momentum w.r.t time	
5.	Work w.r.t. time	

257.

	Physical Quantity	Differentiation of Physical Quantity (Slope)
1.	Work w.r.t. position	
2.	Electric potential w.r.t. distance	
3.	Position w.r.t. time	
4.	Pressure w.r.t. to volume for Isothermal	
5.	Pressure w.r.t. to volume for adiabatic	

258. Double Differentiation:

$y = 1.x^5 + 2.x^4 + 3.x^4 + 4.x^2 + 5.x^1 + 6.x^0$

259. Find 5th order differentiation of given function:

(*i*) $y = e^x$, (*ii*) $y = \sin x$

260. $y = \sin(x^2 + 3x)$ then find dy/dx.

261. $y = e^{\alpha x^2}$ where α is constant find $\left(\frac{dy}{dx}\right)$

262. $y = \alpha \sin(\beta t)$ find $\frac{dy}{dt}$ where α and β are constant.

263. Find double differentiation $y = e^{ax}$

264. $y = 4e^{3t}$ find $\frac{dy}{dt}$.

265. $y = 5 \sin(4 + 3t)$ find $\frac{dy}{dt}$.

266. $y = \cos x - \frac{4}{x^2}$.

267. $y = e^{-\alpha^2 t}$ find $\frac{dy}{dt}$ α is constant.

268. Find differentiation of

(*i*) $y = \log(3x + 4)$

(*ii*) $y = \sin^2 x = (\sin x)^2$

269. Find differentiation of

(*i*) $y = e^{(4x - 3)}$, (*ii*) $y = e^{(x^2 - 2)}$

270. Find differentiation of *y w. r. t. x.* $y = A \sin(\omega t - kx)$

271. $y = x^2$; find $\frac{dy}{dx}$?

272. $y = x^2$ find $\frac{dy}{dt}$ where *x* depends on time.

273. $y = \frac{2}{3}\pi x^2$ find $\frac{dy}{dt} = ?$.

274. If V = $\frac{4}{3}\pi R^3$; find rate of change in volume w.r.t. time $\left(\frac{dV}{dt}\right)$.

275. If radius of circle is increasing $\frac{1}{\pi}$ m/s then find rate of change in area when radius 4 m.

276. If y = x^2 ex then find $\left(\frac{dy}{dx}\right)$.

277. Find differentiation of y = $(x^4 - 1)50$.

278. If $y = \sin\theta$ then find $\left(\frac{dy}{d\theta}\right)$ at $\theta = 30°$.

279. If $y = ex$ then find $\frac{dy}{dx}$ at $x = 2$.

Partial Differentiation

280. If $v = x^2y + y^2z + z^2x$ find $\frac{\partial v}{\partial x}$.

281. If $v = x^3y^2z + y^3xz^2$ find $\frac{\partial v}{\partial y}$

Integration

282. Find integration of

(*i*) $y = x^5$, (*ii*) $y = \frac{1}{x^2}$

283. Questions:

(*i*) $y = x^3$ (*ii*) $y = \sqrt{x}$

(*iii*) $\int \sin x dx$ (*iv*) $\int \cos x\, dx$

(*v*) $\int (x^2 + \sin x)\, dx$ (*vi*) $\int \sin(5x + 4)\, dx$

(*vii*) $\int \cos(2x)\, dx$ (*viii*) $\int (4x - 6)^2\, dx$

(*ix*) $\int \frac{1}{(5x - 3)} dx$ (*x*) $\int e^{(5x+4)}\, dx$

284. If $y = x^2 + 2$ then find integration from $x_1 = 1$ to $x_2 = 3$.

285. If $y = 5$ then integrate if from $x_1 = 2$ to $x_2 = 1$.

286. Integrate $\int_{\frac{\pi}{2}}^{\frac{3\pi}{2}} \cos\theta\, d\theta$

287. Integrate $\int_{-\pi}^{+\pi} \sin\theta\, d\theta$

288. Integrate $\int_{0}^{2\pi} \sin\theta\, d\theta$

289. Integrate $\int_{-\pi/2}^{+\pi/2} \cos\theta\, d\theta$

290. Integrate $\int_{0}^{1} e^x dx =$

291. Integrate $\int_{0}^{\pi/2} (\sin x + \cos x)\, dx =$

292. Integrate $\int_{0}^{\pi} (\sin x + \cos x)\, dx =$

293. Match the following:

Column-I		Column-II	
(A)	$<\sin q>_{\text{Full cycle}}$	(*i*)	$\frac{2}{\pi}$
(B)	$<\sin q>_{\text{Half cycle}}$	(*ii*)	$\frac{1}{2}$
(C)	$<\sin^2 q>_{\text{Half / Full}}$	(*iii*)	$\frac{1}{\sqrt{2}}$
(D)	R.M.S. value of sinq	(*iv*)	0

294. Find value of this integration where K, q_1 and q_2 are constant. $\int_0^r \frac{Kq_1q_2}{r^2} dr$

295. Integrate $\int_{0}^{1} e^{-x} dr$

296. Integrate $\int (4 - 3x)^2\, dx$

297. Integrate $\int_{0}^{\pi} \sin(2x) dx$

298. Integrate $\int \left(\frac{x^3 + 2}{x^3}\right) dx =$

299. Find area of curve $y = x^2$ from $x_1 = 2$ to $x_2 = 5$.

300.

Physical Quantity		Integration of that P.Q. Area of graph
(*i*)	Velocity w.r.t. time	
(*ii*)	Acceleration w.r.t. time	
(*iii*)	Torque w.r.t. time	
(*iv*)	Force w.r.t. time	

301.

Physical Quantity		Integration of that P.Q. Area of graph
(*i*)	Force w.r.t. displacement	
(*ii*)	Electric field w.r.t. distance	
(*iii*)	Pressure w.r.t. volume	
(*iv*)	Power w.r.t. time	

Maxima and Minima

302. Find maxima and minima of $y = x^2 + 5$.

303. Find maxima and minima of $y = 4x - x^2$.

304. If $y = x^2 - 4x + 5$, then find maxima and minima of 'y'.

305. If velocity $V = t^3 - 6t^2 + 12$, then find maxima and minima value of velocity.

306. If acceleration of object $a = \frac{t^3}{3} - \frac{5t^2}{2} + 6t$ then find maximum and minimum acceleration.

307. $y = x^3 - 3x^2 + 4$, find maximum and minimum value.

308. The maxima is the point at which the magnitude of slope of graph is having the maximum value.

(*a*) True (*b*) False

309. **Assertion (A):** In minima, $\left(\frac{dy}{dx} = 0\right)$ and tangent drawn at the point is perpendicular to *x* axis.

Reason (R): At minima $\frac{d^2y}{dx^2}$ = negative as the graph has reached it's minimum value.

(*a*) Assertion (A) is false but Reason (R) is true.
(*b*) Both Assertion (A) and Reason (R) are true but Reason (R) is NOT the correct explanation of Assertion (A).
(*c*) Assertion (A) is true but Reason (R) is false.
(*d*) Both Assertion (A) and Reason (R) are false.

Answer Key

1. (*a*) **2.** (*i*) 1/5, (*ii*) 2/5, (*iii*) 1/2, (*iv*) 3/5, (*v*) 3/4, (*vi*) 33/100 or 1/3, (*vii*) 66/100 or 2/3, (*viii*) 1/4, (*ix*) 4/3, (*x*) 3/2, (*xi*) 13/3, (*xii*) 5/2
3. (*a*) **4.** $x = 7$
5. (*i*) 8.04, (*ii*) 10.05, (*iii*) 3, (*iv*) 185, (*v*) 39.9, (*vi*) 70, (*vii*) 25.981, (*viii*) 15, (*ix*) 10, (*x*) 18.75, (*xi*) 8.04, (*xii*) 4.95, (*xiii*) 0.3325
6. (*b*) **7.** (*i*) 0, (*ii*) 1, (*iii*) 10^3, (*iv*) 20, (*v*) 0.7, (*vi*) 1, (*vii*) 0.9 **8.** (*i*) $\frac{7}{5}$, (*ii*) $\frac{512}{729}$, (*iii*) 5, (*iv*) $\frac{-1}{64}$, (*v*) $\frac{1}{8}$, (*vi*) 40
9. $\frac{7}{1000}$ **10.** (*i*) 0.75, (*ii*) 1.33, (*iii*) 8/y **11.** 2/5 **12.** 16 : 1
13. (*i*) 1100, (*ii*) 0, (*iii*) 28, (*iv*) 48, (*v*) 2, (*vi*) 4, (*vii*) 32, (*viii*) 9/1, (*ix*) t^5, (*x*) $x^{-5/2}$, (*xi*) 3, (*xii*) 243 **14.** (*c*)
15. (*i*) 64, (*ii*) 27, (*iii*) 81, (*iv*) 4 **16.** (*i*) $2^{8/3}$, (*ii*) $2^{16/5}$, (*iii*) 8, (*iv*) 1/8, (*v*) 1/16, (*vi*) 25, (*vii*) 36, (*viii*) 16 **17.** $x = \frac{4}{3}$
18. 81 **19.** 8 **20.** $x = 3$ **21.** 2^4 **22.** $x = 7$ **23.** $x = 60$ **24.** 1 **25.** $x = 3$ **26.** 3 **27.** 1
28. 20 **29.** $x = 5$ **30.** $x = 7$ **31.** $x = 5$ **32.** $x = -3$ **33.** 2 **34.** 9 **35.** 3 **36.** 3
37. (*i*) 3, (*ii*) 15, (*iii*) 2, (*iv*) 43 **38.** 12 **39.** $x = 2$ **40.** $\left(\frac{l}{2\pi}\right)$ **41.** $x = (n)^{1/3} r$ **42.** (*i*) 2, (*ii*) $\sqrt{2}$, (*iii*) $\frac{1}{\sqrt{2}}$, (*iv*) $4\sqrt{3}$, (*v*) 12
43. $\frac{9}{16}$ **44.** $n = \frac{7}{17}$ **45.** $\frac{d}{2}\left(\sqrt{3}+1\right)$ **46.** (*i*) $4\left(1+\frac{x}{2}\right)^2$, (*ii*) $\sqrt{2}\left(2+\frac{x}{2}\right)^{\frac{1}{2}}$ **47.** $\frac{1}{\text{H}}$ **48.** $\frac{\sqrt{3}a^2}{4}$ **49.** $\frac{a}{6}$
50. 30 **51.** (*i*) 90°, (*ii*) 45°, (*iii*) 60°, (*iv*) 150°, (*v*) 120°, (*vi*) 240°, (*vii*) 108°, (*viii*) 900°, (*ix*) 72°, (*x*) 105°, (*xi*) 450°, (*xii*) 540°, (*xiii*) 30°
52. (*i*) $\frac{\pi}{4}$, (*ii*) $\frac{\pi}{3}$, (*iii*) $\frac{2\pi}{3}$, (*iv*) $\frac{\pi}{6}$, (*v*) $\frac{5\pi}{6}$, (*vi*) $\frac{\pi}{2}$, (*vii*) $\frac{5\pi}{3}$ (*viii*) $\frac{3\pi}{2}$, (*ix*) $\frac{3\pi}{4}$, (*x*) 4π, (*xi*) $\frac{\pi}{5}$, (*xii*) $\frac{5\pi}{2}$, (*xiii*) $\frac{22\pi}{9}$ (*xiv*) $\frac{11\pi}{6}$, (*xv*) $\frac{19\pi}{60}$, (*xvi*) 2π
53. 110m **54.** 3437.75 minutes **55.** 120 minutes **56.** 120°
57. (*i*) (20 mm), (*ii*) (4×10^{-6} mm), (*iii*) (4×10^6 PF), (*iv*) (12×10^3 nc) , (*v*) (12×10^6 mg), (*vi*) (6×10^{-6} kg), (*vii*) 2×10^{-6} kg, (*viii*) 4×10^{-3} mc, (*ix*) 4×10^{-1} cm, (*x*) 4×10^6 mm, (*xi*) 20×10^3 nc, (*xii*) 4×10^6 mg **58.** (*c*) **59.** (*b*)

60. (*d*) **61.** (*b*) **62.** (*a*) **63.** (*b*) **64.** (*a*) **65.** (*a*) **66.** H = 25 *m*, $\tan -1\left(\frac{24}{7}\right)$ **67.** (*d*) **68.** 53°

69. (*i*)**0.**6, (*ii*) **0.**8, (*iii*) **0.**75, (*iv*) (*iv*)$\frac{1}{0.6}$, (*v*) $\frac{1}{0.8}$, (*vi*)$\frac{8}{6}$ **70.** $\frac{\sqrt{7}}{4}, \frac{3}{\sqrt{7}}$ **71.** $\frac{4}{5}, \frac{3}{4}$ **72.** $\frac{2}{\sqrt{5}}, \frac{1}{\sqrt{5}}$

73. (Not possible) **74.** (*a*) **75.** (*a*) **76.** 1 **77.** 0 **78.** + 2 **79.** 3/p **80.** 1

81. (*i*) p /90, (*ii*) p/ 60, (*iii*) 1, (*iv*) 1 **82.** (*b*)

83. (*i*) sin A cos B + sin B cos A,(*ii*) sin A cos B – sin B cos A, (*iii*) cos A• cos B – sin A• sin B, (*iv*) cos A• cos B + sin A • sin B

(*v*) $\frac{\tan A + \tan B}{1 - \tan A \cdot \tan B}$ **84.** (*a*) **85.** (*i*)$\frac{\sqrt{3}+1}{2\sqrt{2}}$,(*ii*)$\frac{\sqrt{3}+1}{2\sqrt{2}}$,(*iii*)$\frac{-1}{2}$

86. (*i*) $-\frac{1}{2}$,(*ii*)$\frac{1}{2}$,(*iii*)$\frac{\sqrt{3}}{2}$,(*iv*)$\frac{1}{2}$,(*v*)0,(*vi*)1,(*vii*) -1, (*xii*)$\frac{\sqrt{3}}{2}$,(*xiii*) $-\sqrt{3}$,(*xiv*) -1 **87.** $y = \sqrt{A^2 + B^2}$ **88.** 7

89. (*i*) Max: 3, Min: -3, (*ii*) Max: 5, Min: -5, (*iii*) Max: 6.4, min: -6.4, (*iv*) Max: 8, Min: 2

90. (*i*) -B, (*ii*) -C (*iii*) -A (*iv*) -D **91.** q = 30° **92.** a = 30°, b = 60° **93.** (*c*) **94.** 37°

95. (*i*) Df = p/2, (*ii*) Df = p/6, (*iii*) Df = p, (*iv*) Df = 0

96. **Phase difference:** 90°, 90°, 120°, 0°, 90°, 60°, 120°, **Resultant :** √2 Io sin (q +15°),√2 Io, cos (q +15°), 4 sin (wt + p/3), 8cos (wt), 4√2 sin (wt + p/4), 3√3 sin (wt + p/3), 4 sin q

97. (*b*) **98.** 120° **99.** $x = 5\sin(wt + 37°)$

100. 0 **101.** $\frac{\pi}{6}$ **102.** $\frac{\pi}{2}$ **103.** $\frac{5\pi}{6}$ **104.** $\frac{\pi}{3}$ **105.** *a* and *b* **106.** 10th term = 43, sum = 250

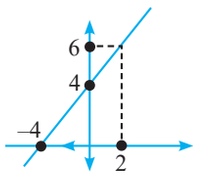
107. (*b*) **108.** 10th term**109.** $x = 16, y = 10$ **110.** 160 Hz **111.** (*c*) **112.** $\frac{2}{3}kq$ **113.** $\frac{5}{8}\Omega$ **114.** $= \frac{4}{3}kqq_0$

115. (*a*) **116.** (*b*) **117.** (*a*) **118.** (*b*) **119.** (*a*) **120.** (*b*) **121.** (*c*) **122.** (*a*) **123.** (*c*) **124.** (*b*)

125. (*c*) **126.** (*b*) **127.** (*a*) **128.** (*a*) **129.** (*a*) **130.** (*a*) **131.** (*a*) **132.** (*a*) **133.** (*c*) **134.** (*b*)

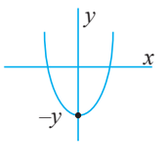
135. (*a*) **136.** (*c*) **137.** (*b*) **138.** (*d*) **139.** (*a*) **140.** (1) –D, (2) –B, (3) –C, (4) –A **141.** $y = -2x + 10$

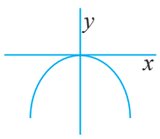
142. $\frac{1}{3}$ **143.** (1) Positive slope, positive intercept, (2) Negative slope, positive intercept, (3)Negative slope, negative intercept, (4)Positive slope negative intercept

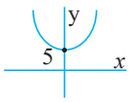
144. 

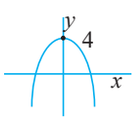
145. (*b*) **146.** False **147.** $(\text{Slope})_2 > (\text{Slope})_1$ **148.** $x = 5$ **149.** (*b*) **150.** $\frac{16}{3}$ m/s

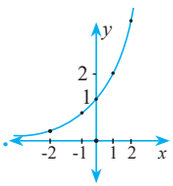
151. $m = -5/2, y = 5$ **152.** $m = -5$, y = –20 **153.** 53

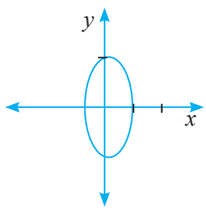
154. (*i*) –D, (*ii*) –C, (*iii*) –B, (*iv*) –A, (*v*) –E, (*vi*) –F **155.** 2 **156.** Not possible **157.** 

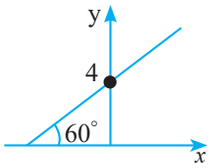
158. 

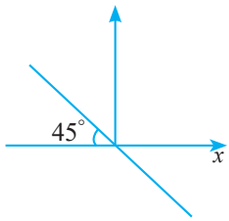
159. 

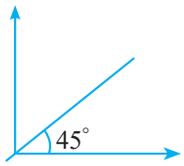
160. 

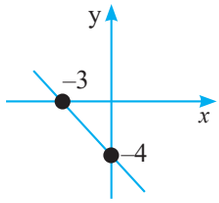
161. 

162. 

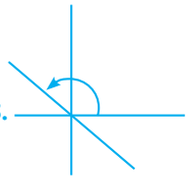
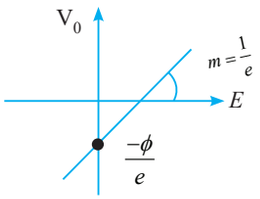
163. (*a*) **164.** (*i*) 

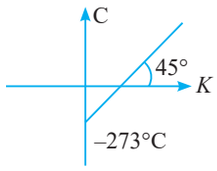
(*ii*) 

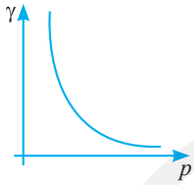
(*iii*) 

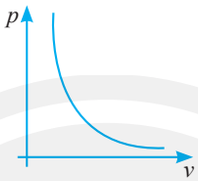
(*iv*) 

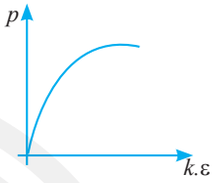
165. i-B, ii - A, iii - D, iv - E , v -C **166.** (*i*) - E, (*ii*) - C, (*iii*) - A, (*iv*) - B , (*v*) -F, (*vi*) - B, (*vii*) - D, (*viii*) - E , (*ix*) - A , (*x*) - E

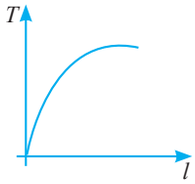
167.  **168.**  **169.** 

170. 

171. (*b*) **172.** (*a*) **173.** 

174. 

175. 

176. 

177. (*b*) **178.** (*b*) **179.** A- Positive, B - Maximum, C - Zero, D - Negative

180. (*i*) slope of A = Negative, slope of B = 0, slope of C = Positive, (*ii*) slope of A = Positive, slope of B = 0, slope of C = Negative

181. (1) – C, (2) – D, (3) – A, (4) – B **182.** 2, 3 **183.** 4,0 **184.** $x = -4, x = -3$ **185.** $-2, +\frac{1}{2}$ **186.** (*a*)

187. (*a*) **188.** (*i*) $x = -2, x = 7$, (*ii*) $x = 4, x = 7$, (*iii*) $x = -5/6, x = 1$, (*iv*) $x = 0$ & $x = 25/12$, (*v*) $x_1 = -5, x_2 = 1$

189. (*i*) $x_1 = 2, x_2 = 7$, (*ii*) $x_1 = 1\ x_2 = 3/2$ **190.** (*i*) $x_1 = 3, x_2 = -1/2$, (*ii*) $x_1 = 2, x_2 = 3$ **191.** (*c*) **192.** (*c*)

193. (*a*) **194.** (*b*) **195.** (*b*) **196.** (*b*) **197.** (*a*) **198.** (*b*) **199.** (*d*) **200.** (*b*) **201.** (*c*) **202.** (*d*)

203. (*d*) **204.** (*a*) **205.** (*b*) **206.** (*b*) **207.** (*c*) **208.** (*c*) **209.** (*b*) **210.** (*i*) 3, (*ii*) $\frac{100}{81}$, (*iii*) 27 log (3)

211. (*b*) **212.** 29 $\log_{10}$e **213.** –**3.**4 **214.** (*i*) $\frac{1}{16}$,(*ii*)∞ **215.**(*i*) 0, (*ii*) 3, (*iii*) 2, (*iv*) 2.3 **216.** (*a*)

217. 10 *dB* **218.** 0.3 **219.** (*b*) **220.** (*a*) **221.** (*a*) **222.** (*c*) **223.** (*a*) **224.** (*a*) **225.** (*b*) **226.** (*a*)

227. (*c*) **228.** (*c*) **229.** (*a*) **230.** (*a*) **231.** (*a*) **232.** (*a*) **233.** (*a*) **234.** (*d*) **235.** (*a*) **236.** (*b*)

237. (*d*) **238.** (*b*) **239.** (*b*) **240.** (*a*) **241.** (*b*) **242.** (*a*) **243.** (*a*) **244.** (*c*) **245.** (*a*) **246.** 0

247. $\frac{dy}{dx} = [2 - 3x^2]$ **248.** $\left[\frac{1}{2\sqrt{x}} - \frac{x^{-3/2}}{2}\right]$ **249.** $\frac{dy}{dx} = 1 - \frac{1}{x^2}$ **250.** Perpendicular, $\frac{\pi^2}{45}$, p, force **251.** (*b*)

252. $\sec^2 x \log x + \frac{\tan x}{x}$ **253.** $-\sin x - \frac{6}{x^4}$ **254.** $-\frac{12x^2}{(x^3+1)^2}$

255. (*i*) $2x \cos x - x^2 \sin x$, (*ii*) $4x \cos(2x^2)$, (*iii*) $wA \cos(wt + 5)$,(*iv*) $3(1 - 8x)(x - 4x^2)^2$ ·(*v*) $50 \cos(50x)$, (*vi*) $\frac{-8x}{(x^2-4)^2}$,
(*vii*) $\frac{-8x}{(x^2-4)^2}$ (*viii*) $\frac{x}{\sqrt{x^2+5}}$

256. 1-force, 2: acceleration, 3-gravitational field intensity 3: torque, 4: Power

257. 1: Force, 2: Negative of electric fied, 3: Velocity, 4: $-p/v$, 5: $-\gamma p/v$ **258.** $\Rightarrow 20x^3 + 24x^2 + 36x^2 + 8$

259. (*i*) e^x, (*ii*)sin x **260.** cos $(x^2 + 3x) \times [2x + 3]$ **261.** $\frac{dy}{dx} = 2\alpha x\, e^{\alpha x^2}$ **262.** ab cos (bt) **263.** $\frac{d^2y}{dx^2} = a^2e^{ax}$ **264.** $12e^{3t}$

265. $\frac{dy}{dt} = 15\cos(4+3t)$ **266.** $\frac{8}{x^3} - \sin x$ **267.** $-a^2e^{-a2t}$ **268.** (*i*) $\frac{3}{(3x+4)}$, (*ii*) 2(sin$x$) cos(x)

269. (*i*) $4e^{(4x-3)}$ (*ii*) $2xe^{(x^2-2)}$ **270.** $\frac{dy}{dx} = -kA\cos(wt - kx)$ **271.** $2x$ **272.** $2x\left(\frac{dx}{dt}\right)$ **273.** $\frac{4\pi}{3}x\left(\frac{dx}{dt}\right)$

274. $4\pi R^2\left(\frac{dR}{dt}\right)$ **275.** 8 **276.** $\frac{dy}{dx} = 2xe^x + x^2e^x$ **277.** 50 $(x^{4-1})^{49} \times 4x^3$ **278.** $\sqrt{\frac{3}{2}}$ **279.** e^2

280. $\frac{dv}{dx} = 2xy + z^2$ **281.** $\frac{\partial v}{\partial y} = 2yx^3z + 3y^2x^2z$ **282.** (*i*) $\frac{x^6}{6} + c$, (*ii*) $-\frac{1}{x} + c$

283. (*i*) $\frac{x^4}{4}$, (*ii*) $\frac{2x^{\frac{3}{2}}}{3}$, (*iii*) $-\cos x$, (*iv*) $\sin x$, (*v*) $\frac{x^2}{3} - \cos x$, (*vi*) $-\frac{\cos(5x+4)}{5}$, (*vii*) $\frac{\sin(2x)}{2}$ (*viii*) $\frac{(4x-6)^3}{12}$, (*ix*) $\frac{1}{5}\ell n(5x-3)$, (*x*) $\frac{e^{(5x+4)}}{5}$

284. 38/3 **285.** –5 **286.** –2 **287.** 0 **288.** 0 **289.** +2 **290.** $e - 1$ **291.** 2 **292.** 2

293. A– (*iv*), B (*i*), C (*ii*), D – (*iii*) **294.** $-\frac{kq_1q_2}{r}$ **295.** $\frac{1}{e} - 1$ **296.** $\frac{-(4-3x)^3}{9}$ **297.** 0 **298.** $x - \frac{1}{x^2}$

299. 39 **300.** Displacement, Change in velocity, Change in Angular Momentum, Change in linear Momentum

301. Work, Change in electric potential, Work **302.** Minima of y is 5 at x is zero

303. Maximum value of y is 4 at $x = 2$ No minima. **304.** Minimum value of $y = 1$ at $x = 2$

305. Maxima =12, Minima = –20 **306.** Maximum = 4.66 Minimum = 4.5

307. Maximum = 4, minimum = 0 **308.** (*b*) **309.** (*d*)