Range of Trigonometric Functions DPP - 01

1. **If $\sec\theta = \frac{5}{3}$, find $\sin\theta$ and $\tan\theta$?**

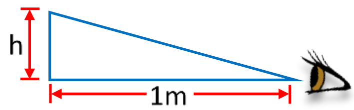
(1) $\frac{3}{5}, \frac{3}{4}$ (2) $\frac{4}{5}, \frac{4}{3}$ (3) $\frac{5}{4}, \frac{4}{3}$ (4) $\frac{4}{5}, \frac{3}{4}$

2. **Find the values of :**

(i) tan (-30°) **(ii) cos 150°** **(iii) sin 210°**

(1) $\frac{1}{\sqrt{3}}, \frac{\sqrt{3}}{2}, \frac{1}{2}$ (2) $-\frac{1}{\sqrt{3}}, -\frac{\sqrt{3}}{2}, -\frac{1}{2}$ (3) $-\frac{1}{\sqrt{3}}, -\frac{\sqrt{3}}{2}, \frac{1}{2}$ (4) $-\frac{1}{\sqrt{3}}, +\frac{\sqrt{3}}{2}, -\frac{1}{2}$

3. **A normal human eye can see an object making an angle of 1.8° at the eye. What is the**



approximate height of object which can be seen by an eye placed at a distance of 1 m from the object.

(1) 0.031 m (2) π m (3) 0.031 cm (4) 0.31 m

4. **Convert the angle from degree to radian :**

(a) 210° **(b) 315°**

(1) $\frac{7\pi}{6}, \frac{7\pi}{4}$ (2) $\frac{5\pi}{6}, \frac{5\pi}{4}$ (3) $\frac{\pi}{6}, \frac{\pi}{4}$ (4) $\frac{3\pi}{6}, \frac{3\pi}{4}$

5. **Convert the following angle from radian to degree**

(a) $\frac{3\pi}{4}$ rad **(b) $\frac{7\pi}{6}$ rad**

(1) 135°, 210° (2) 210°, 135° (3) 225°, 240° (4) 135°, 225°

6. **Find the value of the following :-**

(a) $\cot\left(\frac{3\pi}{4}\right)$ **(b) $\cos\left(\frac{7\pi}{6}\right)$**

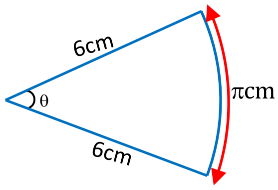
(1) $-1, -\frac{1}{2}$ (2) $+1, \frac{1}{2}$ (3) $-1, \frac{1}{2}$ (4) $+1, -\frac{1}{2}$

7. **The maximum and minimum values of expression $(4 - 2\cos\theta)$ respectively are**

(1) 4 and 0 (2) 4 and 2 (3) 6 and 0 (4) 6 and 2

8. **A circular arc is of length π cm. Find angle subtended by it at the centre in radian and degree.**

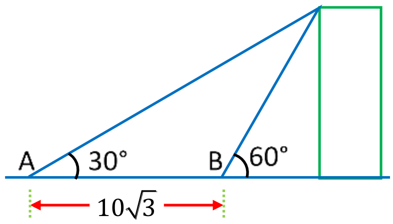
(1) 60°
(2) 30°
(3) 90°
(4) 15°



9. **What is value of expression $2(\sin 15^\circ + \sin 75^\circ)^2$?**

(1) 3/2 (2) ½ (3) 2 (4) 3

10. **Angle of elevation is the angle which line of sight makes with the horizontal. Angle of elevation of the top of a tall building is 30° from a place A and becomes 60° from another place B that is 10Ö3 m from A towards the building as shown in the figure. Height of the building is close to**



(1) 7.5 m (2) 10 m (3) 12.5 m (4) 15 m

11. **Value of sin (37°) cos (53°) is -**

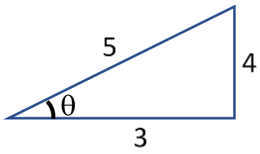
(1) $\frac{9}{25}$ (2) $\frac{12}{25}$ (3) $\frac{16}{25}$ (4) $\frac{3}{5}$

Answer key

Question	1	2	3	4	5	6	7	8	9	10	11
Answer	2	2	1	1	1	3	4	2	4	4	1

SOLUTIONS

1. **(2)**



$\sec\theta = \frac{5}{3}$

$\therefore \cos\theta = \frac{3}{5}$

$\sin\theta = \frac{4}{5};\ \tan\theta = \frac{4}{3}$

2. **(2)**

(i) $\tan(-30°) = -\tan 30° = -\frac{1}{\sqrt{3}}$

(ii) $\cos(150°) = \cos(90°+60°) = -\sin(60°) = -\frac{\sqrt{3}}{2}$

(iii) $\sin(210°) = \sin(180°+30°) = -\sin(30°) = -\frac{1}{2}$

3. **(1)**

θ is very small

$\therefore \tan\theta \approx \theta$

$\theta = \frac{1.8° \times \pi}{180°} = \frac{\pi}{100}\text{rad}$

$\frac{h}{1} = \frac{\pi}{100}$

$\therefore$ h = 0.031 m

4. **(1)**

(a) $\frac{210° \times \pi}{180°} = \frac{7\pi}{6}$ (b) $\frac{315° \times \pi}{180°} = \frac{7\pi}{4}$

5. **(1)**

(a) $\frac{3\pi}{4}\times\frac{180°}{\pi}=135°$ (b) $\frac{7\pi}{6}\times\frac{180°}{\pi}=210°$

6. **(3)**

(a) $=\cot\left(\frac{3\pi}{4}\right)=\cot\left(\pi-\frac{\pi}{4}\right)=-\cot\frac{\pi}{4}=-1$

(b) $=\cos\left(2\pi+\frac{\pi}{3}\right)=\cos\left(\frac{\pi}{3}\right)=\frac{1}{2}$

7. **(4)**

Maximum value of $\cos\theta$ =1

Minimum value of $\cos\theta$ =-1

$\therefore$ Maximum value of given function is = $(4-2(-1))=6$

$\therefore$ Minimum value of given function is = $(4-2(1))=2$

8. **(2)**

$\theta=\frac{s}{r}=\frac{\pi cm}{6cm}=\frac{\pi}{6}rad=30°$

9. **(4)**

= $2(\sin 15°+\sin 75°)^2$

= $2(\sin 15°+\cos 15°)^2$ $(\because \sin\theta=\cos(\pi/2-\theta))$

= $2[\sin^2 15° + \cos^2 15° + 2\sin 15°\cos 15°]$

= $2[1 + \sin 30°]$ $(\because 2\sin\theta\cos\theta=\sin 2\theta)$

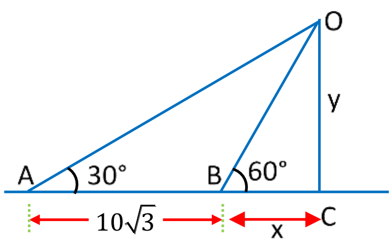
= 3

10. **(4)**

For ΔBCO

$\tan 60° = \frac{y}{x}$

$x=\left(\frac{y}{\sqrt{3}}\right)$ ...(i)



For ΔACO

$\tan 30^\circ = \frac{y}{(x + 10\sqrt{3})}$

$\frac{1}{\sqrt{3}} = \frac{y}{\left(\frac{y}{\sqrt{3}} + 10\sqrt{3}\right)}$

y + 30 = 3y

y = 15m

11. **(1)**

$\sin 37^\circ = \frac{3}{5}$

$\cos 53^\circ = \frac{3}{5}$

$\Rightarrow$ sin (37°) cos (53°) = $\frac{9}{25}$

Equation of Straight Line DPP - 02

1. Distance between two points (8, – 4) and (0, a) is 10. All the values are in the same unit of length. Find the positive value of a.

(1) –10 (2) +2 (3) –2 (4) +10

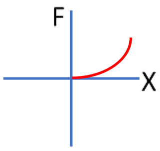
2. Calculate the distance between two points (0, –1, 1) and (3, 3, 13).

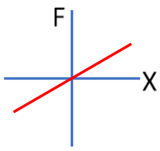
(1) 12 (2) 9 (3) 16 (4) 13

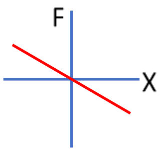
3. The slope of straight line 2y = 3x+5;

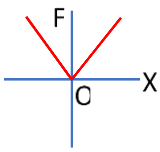
(1) 3 (2) 1 (3) $\frac{3}{2}$ (4) $\frac{5}{2}$

4. The spring force is given by F = -kx, here k is a constant and x is the deformation of spring. The F-x graph is -

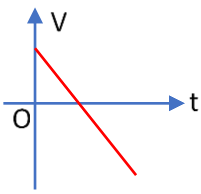
(1) 

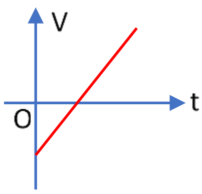
(2) 

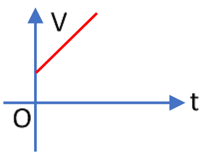
(3) 

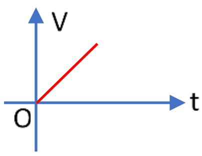
(4) 

5. If velocity v varies with time(t) as v = 2t – 3, then the plot between v and t is best represented by :

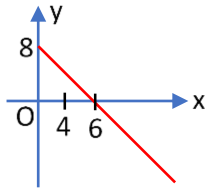
(1) 

(2) 

(3) 

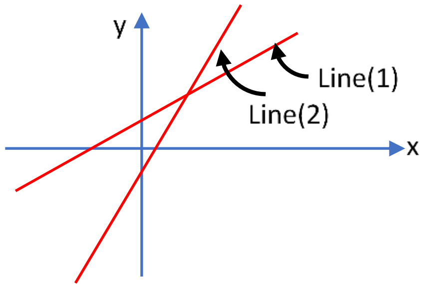
(4) 

6. **The equation of straight line shown in figure is :**



(1) $6x + 8y = 15$ (2) $4x + 3y = 18$ (3) $2y + 6x = 7$ (4) $3y + 4x = 24$

7. **Which of the following statement is not correct for following straight line graph :-**



(1) Line (2) has negative y intercept

(2) Line (1) has positive y intercept

(3) Line (2) has positive slope

(4) Line (1) has negative slope

Answer key

Question	1	2	3	4	5	6	7
Answer	**2**	**4**	**3**	**3**	**2**	**4**	**4**

SOLUTIONS

1. **(2)**

Let P(8, –4) and Q(0, a) be two points, distance PQ is 10.

$\therefore$ According to distance formula

$PQ = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$= \sqrt{(0-8)^2 + (a+4)^2}$

$\Rightarrow PQ = \sqrt{64 + (a^2 + 16 + 8a)}$

$\Rightarrow 10 = \sqrt{80 + a^2 + 8a}$

$\Rightarrow a^2 + 8a + 80 = 100 \quad \Rightarrow a^2 + 8a = 20$

$\Rightarrow a^2 + 10a - 2a - 20 = 0$

$\Rightarrow (a - 2)(a + 10) = 0 \quad \Rightarrow (a = 2)$ and $(a = -10)$

$\therefore a = 2$

2. **(4)**

$P(x_1, y_1, z_1) = (0, -1, +1)$

and $Q(x_2, y_2, z_2) = (3, 3, 13)$

using distance formula

$\Rightarrow PQ = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$

$= \sqrt{9 + 16 + 144} = \sqrt{169} = 13$

3. **(3)**

$2y = 3x + 5$ (given equation) ....(i)

$y = mx + c$ (general equation) ....(ii)

Comparing equation (i) and (ii)

slope = m = $\frac{3}{2}$

4. **(3)**

F = -kx (given equation) ...(i)

y = mx + C (general equation) ...(ii)

Comparing Both equations

Slope = m = -K-; Negative slope

Intercept = C = 0; So line passing through origin

5. **(2)**

v = 2t − 3

y = mx + c

m = 2; c = −3

6. **(4)**

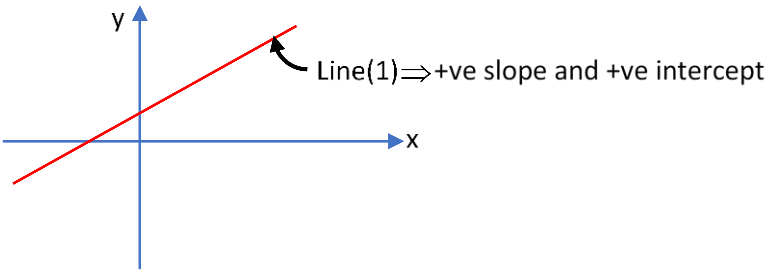
C = 8, $m = \frac{8}{6} = \frac{4}{3}$

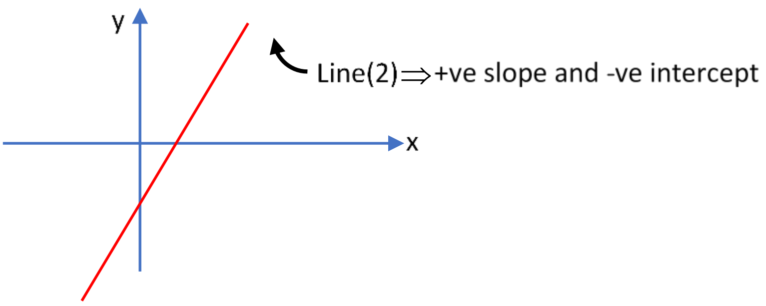
y = mx + c

$y = \frac{4}{3}x + 8$

$\therefore 3y = 4x + 24$

7. **(4)**





Rules of Differentiation - Basic DPP - 03

1. Find derivative of y = 8, w.r.t x -

(1) 8x (2) 0 (3) can't find (4) None

2. Differentiate with respect to x –

$$\frac{d}{dx}\left(\frac{4}{x^3}\right)$$

(1) $\frac{x^{-2}}{-2}$ (2) $12x^4$ (3) $\frac{-12}{x^4}$ (4) $\frac{4}{x^2}$

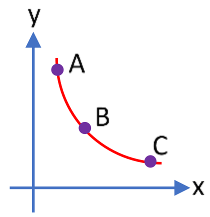
3. If y = $\log_e x$ + sinx + e^x then $\frac{dy}{dx}$ is -

(1) $\frac{1}{x}+\sin+e^x$ (2) $\frac{1}{x}-\cos x+e^x$ (3) $\frac{1}{x}+\cos x+e^x$ (4) $\frac{1}{x}-\sin x$

4. Find derivative of $y=x^3+\frac{4}{3}x^2-5x+1$

(1) $\frac{x^4}{4}+\frac{4x^3}{9}-\frac{5x^2}{2}+x$ (2) $3x^2+\frac{8}{3}x-5$ (3) x^2+x-5 (4) None

5. The slope of graph in figure at point A, B and C is m_A, m_B and m_C respectively, then :



(1) $m_A > m_B > m_C$ (2) $m_A < m_B < m_C$ (3) $m_A = m_B = m_C$ (4) $m_A = m_C < m_B$

6. If y = a sin x + b cos x, then $y^2+\left(\frac{dy}{dx}\right)^2$ is a -

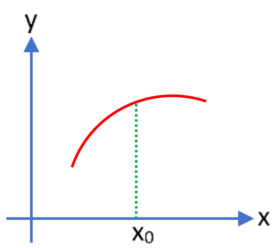
(1) Function of x (2) Function of y (3) Function of x and y (4) Constant

7. Find differentiation of y w.r.t. x –
If $y=4\ell nx+\cos x$

(1) $\frac{4}{x}+\sin x$ (2) $4\ell nx-\sin x$ (3) $\frac{4}{x}-\sin x$ (4) $\frac{4}{x}+\cos x$

8. Which of the following statements are true based on graph of y-versus x as shown below?

(1) Slope at x_0 is positive and non-zero in graph
(2) Slope is constant in graph
(3) Slope at x_0 is negative in graph
(4) None



Answer key

Question	1	2	3	4	5	6	7	8
Answer	**2**	**3**	**3**	**2**	**2**	**4**	**3**	**1**

SOLUTIONS

1. **(2)**

$$\frac{d}{dx}(8)=0$$

$$\left\{\frac{d(c)}{dx}=0;\ \text{where c is constant}\right\}$$

2. **(3)**

$$\frac{d}{dx}\left(\frac{4}{x^3}\right)=\frac{d}{dx}(4x^{-3})$$

$$=4(-3)x^{-4}=\frac{-12}{x^4}$$

3. **(3)**

$$\frac{dy}{dx}=\frac{d}{dx}(\log_e x)+\frac{d}{dx}(\sin x)+\frac{d}{dx}(e^x)$$

$$=\frac{1}{x}+\cos x+e^x$$

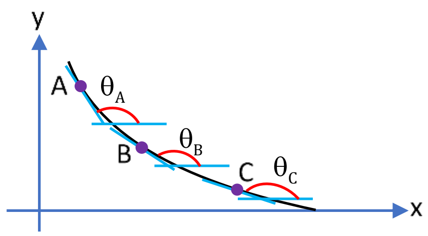
4. **(2)**

$$\Rightarrow \frac{d}{dx}\left(x^3+\frac{4}{3}x^2-5x+1\right)$$

$$\Rightarrow dx(x^3)+\frac{d}{dx}\left(\frac{4}{3}x^2\right)-\frac{d}{dx}(5x)+\frac{d}{dx}(1)$$

$$=3x^2+\frac{8}{3}x-5$$

5. **(2)**



$\because\ \theta_A<\theta_B<\theta_C$ (all are obtuse)

$\Rightarrow \tan\theta_A<\tan\theta_B<\tan\theta_C$

$\Rightarrow m_A<m_B<m_C$

6. **(4)**

y = a sin x + b cos x ....(i)

$$\frac{dy}{dx}=\frac{d}{dx}(a\sin x+b\cos x)$$

$=a\cos x-b\sin x$ ....(ii)

Now, $y^2+\left(\frac{dy}{dx}\right)^2=(i)^2+(ii)^2$

$$=a^2\sin^2 x+b^2\cos^2 x+2a\sin x b\cos x+a^2\cos^2 x+b^2\sin^2 x-2a\cos x b\sin x$$

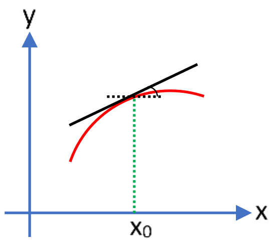
$=a^2+b^2$ = constant

7. **(3)**

$$\frac{dy}{dx}=\frac{d}{dx}(4\ell nx+\cos x)$$

$$=\frac{d}{dx}(4\ell nx)+\frac{d}{dx}(\cos x)=4\left(\frac{1}{x}\right)-\sin x$$

8. **(1)**



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GDPP
GGSRDN DAILY PRACTICE PROBLEM

Rules of Differentiation - Chain Rule DPP - 04

1. **Find value of $\frac{dy}{dx}$, If y = (x-1) (2x+5)**

(1) 4x+5 (2) 3 (3) 4x+3 (4) x+3

2. **Find the derivative of $y=\frac{3x+4}{4x+5}$**

(1) $\frac{-1}{(4x+5)^2}$ (2) $\frac{1}{(4x+5)^2}$ (3) $\frac{24x+31}{(4x+5)^2}$ (4) $\frac{-24x-31}{(4x+5)^2}$

3. **Find the first derivative of y = xsinx**

(1) -xcos+sinx (2) -xcosx+x^2sinx (3) xsinx+cosx (4) xcosx+sinx

4. **Find value of $\frac{dy}{dx}$, If y = 2cos$\left(\sqrt{x}\right)$**

(1) $\frac{-1}{2\sqrt{x}}\sin(\sqrt{x})$ (2) $\frac{1}{\sqrt{x}}\sin(\sqrt{x})$ (3) $\frac{1}{2\sqrt{x}}\sin(\sqrt{x})$ (4) $\frac{-1}{\sqrt{x}}\sin(\sqrt{x})$

5. $\frac{d}{dx}(e^{100})$ = ...

(1) e^{100} (2) 0 (3) $100e^{999}$ (4) None of these

6. **If y = x^3cosx then $\frac{dy}{dx}$ = ...**

(1) x^2(3cosx – x sinx) (2) x^2(3cosx + x sinx) (3) $3x^2$ cosx + x^3 sinx (4) None of these

7. **If y = sin x & x = 3t then $\frac{dy}{dt}$ will be**

(1) 3 cos (x) (2) cos x (3) –3 cos (x) (4) –cos x

8. **If y = $\frac{3x}{\tan x}$ then $\frac{dy}{dx}$ will be -**

(1) $\frac{3}{\sec^2 x}$ (2) $\frac{3\tan x-3x\sec^2 x}{\tan^2 x}$ (3) $\frac{3\tan x+3x\sec^2 x}{\tan^2 x}$ (4) $\frac{3x\sec^2 x-3\tan x}{\tan^2 x}$

9. **If y = 2sin $(\omega t+\phi)$ where ω and ϕ constants then $\frac{dy}{dx}$ will be -**

(1) $2\cos(\omega+\phi)$ (2) $2\omega\sin(\omega t+\phi)$ (3) $2\omega\cos(\omega t+\phi)$ (4) $-2\omega\cos(\omega t+\phi)$

10. **If $y = \tan x \cdot \cos^2 x$ then $\frac{dy}{dx}$ will be -**

(1) $1+2\sin^2 x$ (2) $\sin^2 x-\cos^2 x$ (3) $\sin^2 x+\cos^2 x$ (4) $1-2\sin^2 x$

11. **If $y = 4e^{x^2-2x}$ then $\frac{dy}{dx}$ will be -**

(1) $(8x-8)(e^{x^2-2x})$ (2) $(2x-2)(e^{x^2-2x})$ (3) $(8x-8)(e^{2x-2})$ (4) $4e^{x^2-2x}$

12. **Find the derivative of $y = 4\sin 3x$**

(1) $4\cos 3x$ (2) $12\cos(3x)$ (3) $\frac{4}{3}\cos(3x)$ (4) None

13. **Find the derivative of y, w.r.t. t**

$y=\ell n(t^2+t)$

(1) $\frac{1}{t^2+t}$ (2) $\frac{1}{2t+1}$ (3) $\frac{2t+1}{t^2+t}$ (4) $\frac{1}{(2t+1)(t^2+t)}$

14. **Find derivative of $y = (x^3+1)^2$**

(1) $(x^3+1)(3x^2)$ (2) $2(x^3+1)$ (3) $2(3x^2)$ (4) $2(x^3+1)(3x^2)$

Answer key

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Answer	**3**	**1**	**4**	**4**	**2**	**1**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**

SOLUTIONS

1. **(3)**

$$\frac{dy}{dx}=\frac{d}{dx}(x-1)(2x+5)$$

$$=(x-1)[2]+(2x+5)(1)$$

$$=2x-2+2x+5=4x+3$$

2. **(1)**

$$\frac{dy}{dx}=\frac{d(3x+4)}{dx(4x+5)}$$

$$=\frac{(4x+5)\frac{d}{dx}(3x+4)-(3x+4)\frac{d}{dx}(4x+5)}{(4x+5)^2}$$

$$=\frac{(4x+5)(3)-(3x+4)(4)}{(4x+5)^2}=\frac{-1}{(4x+5)^2}$$

3. **(4)**

$$\frac{dy}{dx}=\frac{d}{dx}(x\sin x)$$

$$=x\frac{d}{dx}(\sin x)+\sin x\frac{d}{dx}(x)$$

$$=x(\cos x)+\sin x$$

4. **(4)**

Let $U=x^{1/2}$; $\quad y=2\cos(U)$

$$\frac{dv}{dx}=\frac{1}{2}x^{-1/2} \qquad \frac{dy}{dv}=-2\sin u$$

$$\frac{dy}{dv}=\frac{dv}{dx}\times\frac{dy}{dv} \qquad =\frac{1}{2}x^{-1/2}\times(-2\sin v)$$

$$=-\frac{1}{\sqrt{x}}\sin(\sqrt{x})$$

5. **(2)**

$\frac{d}{dx}$ (constant) = 0

6. **(1)**

$y = x^3 \cos x$

apply product rule

$$\frac{dy}{dx} = 3x^2 \cos x - x^3 \sin x$$

$= x^2(3 \cos x - x \sin x)$

7. **(1)**

$y = \sin x \qquad x = 3t$

$$\frac{dy}{dx} = \cos x \qquad \frac{dx}{dt} = 3$$

$$\frac{dy}{dt} = \frac{dy}{dx} \times \frac{dx}{dt} = 3\cos x$$

8. **(2)**

$$\frac{dy}{dx} = \frac{d(3x)}{dx(\tan x)}$$

$$= \frac{\tan x \frac{d}{dx}(3x) - (3x)\frac{d}{dx}(\tan x)}{(\tan^2 x)}$$

$$= \frac{3\tan x - 3x\sec^2 x}{\tan^2 x}$$

9. **(3)**

$u = \omega t + \phi; \qquad y = 2\sin(u)$

$$\frac{du}{dt} = \omega; \qquad \frac{dy}{du} = 2\cos u$$

$$\frac{dy}{dt} = \frac{du}{dt} . \frac{dy}{du}$$

$$\frac{dy}{dt} = (\omega)(2\cos u) = 2\omega\cos(\omega t + \phi)$$

10. **(4)**

$y = \tan x \, . \cos^2 x = \frac{\sin x}{\cos x} . \cos^2 x = \sin x \cos x$

$$\frac{dy}{dx} = \sin x \frac{d}{dx}(\cos x) + \cos x \frac{d}{dx}(\sin x)$$

$= \sin x(-\sin x) + \cos x(\cos x)$

$= -\sin^2 x + \cos^2 x = 1 - 2\sin^2 x$

11. **(1)**

$u = x^2 - 2x; \qquad y = 4e^u$

$\frac{du}{dx} = 2x - 2 \qquad \frac{dy}{du} = 4e^u$

$\frac{dy}{dx} = \frac{du}{dx} \times \frac{dy}{du} = (2x-2)(4e^u)$

$= 4(2x-2)(e^{x^2-2x}) = (8x-8)(e^{x^2-2x})$

12. **(2)**

u = 3x   y = 4sin(u)

$\frac{du}{dx} = 3 \qquad \frac{dy}{du} = 4\cos u$

$\frac{dy}{dx} = \frac{du}{dx} * \frac{dy}{du}$ = 3(4cosu)

=12cos(3x)

13. **(3)**

$u = t^2 + t \qquad y = \ell n(u)$

$\frac{dy}{dt} = \frac{du}{dt} \times \frac{dy}{du} \qquad = (2t+1)\left(\frac{1}{u}\right)$

$= \frac{2t+1}{t^2+t}$

14. **(4)**

$u = \left(x^3 + 1\right) \qquad y = \left(u^3\right)$

$\frac{du}{dx} = 3x^2 \qquad \frac{dy}{dy} = 2u$

$\frac{dy}{dx} = \frac{du}{dx} \times \frac{dy}{du} \qquad = (2u)(3x^2)$

$= 2(x^3+1)(3x^2)$

Concept of Maxima and Minima DPP - 05

1. **For a straight line $3y=\sqrt{3}x+3$. Choose correct alternative(s)**

(1) $\frac{dy}{dx}=\tan 30°$ (2) $\frac{dx}{dy}=\cot 30°$ (3) y–intercept is 1 (4) All correct

2. **If radius of a spherical bubble starts to increase with time t as r = 0.5t. What is the rate of change of volume of the bubble with time t = 4s ?**

(1) 8π units/s (2) 4π units/s (3) 2π units/s (4) π units/s

3. **The slope of the tangent to the curve**

y = ln (sinx) at x = $\frac{3\pi}{4}$ is

(1) 1 (2) –1 (3) $\ell n\sqrt{2}$ (4) $\frac{1}{\sqrt{2}}$

4. **The charge flowing through a conductor beginning with time t=0 is given by the formula $q=2t^2+3t+1$ (coulombs). Find the current i = $\frac{dq}{dt}$ at the end of the 5th second.**

(1) 23 (2) 66 (3) $\frac{31}{6}$ (4) 5

5. **A metallic disc is being heated. Its area (in m^2) at any time t (in sec) is given by $A = 4t^2 + 2t$. Calculate the rate of increase in area at t = 4sec.**

(1) 72 m^2/sec (2) 72 m^2 (3) 34 m^2/sec (4) 34 m^2

6. **A car moves along a straight line whose equation of motion is given by**

$s = 12t + 3t^2 - 2t^3$

where s is in metres and t is in seconds. The velocity of the car at start will be :–

(1) 7 m/s (2) 9 m/s (3) 12 m/s (4) 16 m/s

7. **If y = sinx + cosx then $\frac{d^2y}{dx^2}$ is :-**

(1) sinx – cosx (2) cosx – sinx (3) –(sinx + cosx) (4) None of these

8. **Given that $y=\frac{10}{\sin x+\sqrt{3}\cos x}$. Minimum value of y is**

(1) zero (2) 2 (3) 5 (4) $10/(1+\sqrt{3})$

9. **Find maxima and minima of function -**

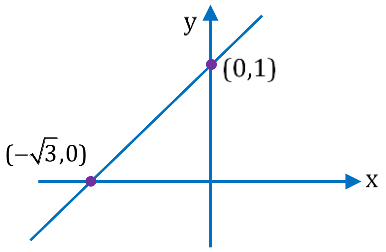
(1) 8,4 (2) 4,8 (3) 4,0 (4) 0,8

Answer key

Question	1	2	3	4	5	6	7	8	9
Answer	**4**	**1**	**2**	**1**	**3**	**3**	**3**	**3**	**2**

SOLUTIONS

1. **(4)**



$3y=\sqrt{3}x+3$

(i) $\frac{dy}{dx}=\frac{1}{\sqrt{3}}=\tan 30°$

(ii) $\frac{dx}{dy}=\frac{\sqrt{3}}{1}=\cot 30°$

(iii) y–intercept means (x = 0) $\Rightarrow$ y = 1

2. **(1)**

Given r = 0.5 t

$\frac{dr}{dt}=0.5$

$v=\frac{4}{3}\pi r^3$

$\frac{dV}{dr}=4\pi r^2\frac{dr}{dt}$

at t = 4 sec

r = 0.5(4) $\Rightarrow$ r = 2

So $\left(\frac{dV}{dt}\right)_{t=4}=4\pi(2)^2(0.5)$

$=8\pi$

3. **(2)**

$y=\ell n(\sin x)$

$\frac{dy}{dx}=\frac{1}{\sin x}(\cos x)=\cot x$

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

$\frac{dy}{dx}=\cot\left(\frac{3\pi}{4}\right)=-1$

4. **(1)**

$q = 2t^2 + 3t + 1$

$$\frac{dq}{dt} = 4t + 3$$

$i_{t=5} = 4(5) + 3$

$i_{t=5} = 23$

5. **(3)**

$A = 4t^2 + 2t$

$$\frac{dA}{dt} = 8t + 2$$

at t = 4 sec.

$$\frac{dA}{dt} = 8(4) + 2 = 34 \text{ m}^2/\text{sec}$$

6. **(3)**

$$v = \frac{ds}{dt}$$

$v = 12 + 6t - 6t^2$

At $t = 0 \Rightarrow V = 12$m/s

7. **(3)**

$y = \sin x + \cos x$

$$\frac{dy}{dx} = \cos x - \sin x$$

$$\frac{d^2y}{dx^2} = -\sin x - \cos x$$

$= -(\sin x + \cos x)$

8. **(3)**

$$\frac{dy}{dx} = \frac{d}{dx}\left(\frac{10}{\sin x + \sqrt{3}\cos x}\right)$$

$$= \frac{\sin x \frac{d}{dx}(10) - 10\frac{d}{dx}(\sin x + \sqrt{3}\cos x)}{(\sin x + \sqrt{3}\cos x)^2} = 0$$

$$\Rightarrow 0 - 10(\cos x + \sqrt{3}(-\sin x)) = 0$$

$$\Rightarrow \cos x - \sqrt{3}\sin x = 0$$

$$\Rightarrow \frac{\cos x}{\sin x} = \sqrt{3}$$

$$\Rightarrow \cot x = \sqrt{3}$$

$$\Rightarrow x = 30^\circ$$

$$\therefore y = \frac{10}{\sin(30^\circ) + \sqrt{3}\cos(30^\circ)} = \frac{10}{\frac{1}{2} + \left(\sqrt{3}\right)\left(\frac{\sqrt{3}}{2}\right)} = \frac{10}{2} = 5$$

9. **(2)**

Step-1

$y = x^3 - 18x^2 + 96x$

$\frac{dy}{dx} = 3x^2 - 36x + 96$

$= x^2 - 12x + 32$

Step-2

$x^2 - 12x + 32 = 0$

$(x-8)(x-4) = 0$

$\therefore$ x = 8 or x = 4

Step-3

$\frac{d^2y}{dx^2} = (2x - 12)$

at x = 8 $\frac{d^2x}{dx^2} > 0$ at x = 4 $\frac{d^2y}{dx^2} < 0$

at x = 8, minima at x = 4 maxima

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Definite Integration DPP - 06

1. **Evaluate the indefinite integral** $\int \frac{dx}{(4x+5)}$ -

(1) $\log_e(4)$ (2) $\log_e(4x+5)+c$ (3) $\frac{1}{4}\log_e(4x+5)+c$ (4) None

2. **Evaluate** $\int \frac{dx}{\sqrt[3]{x}}$ -

(1) $\frac{3}{2}x^{-2/3}+c$ (2) $\frac{2}{3}x^{-3/2}+c$ (3) $\frac{2}{3}x^{3/2}+c$ (4) $\frac{3}{2}x^{2/3}+c$

3. **Integrate** $\int (2x^3 - x^2 + 1)dx$ -

(1) 6x-2x+c (2) $6x^2$-2x+1+c (3) $\frac{x^4}{2} - \frac{x^3}{3} + x + c$ (4) None

4. **Evaluate** $\int \left(x^2 - \cos x + \frac{1}{x}\right)dx$ -

(1) $x^3 - \sin x + \ell nx + c$ (2) $2x + \sin x + \ell nx + c$ (3) $\frac{x^3}{3} + \sin x + \ell nx + c$ (4) $\frac{x^3}{3} - \sin x + \ell nx + c$

5. $\int \cos^2 x dx$ -

(1) $\frac{x}{2} + \frac{\sin 2x}{4} + c$ (2) $\frac{x}{2} + \frac{\sin 2x}{2} + c$ (3) $-2\sin x + c$ (4) $2\sin x + c$

6. **The value of integral** $\int_0^{\pi/2} \cos x dx$ -

(1) 0 (2) 1 (3) -1 (4) None

7. **The value of** $\int_2^3 (x^3 - 4x^2 + 5x - 10)dx$ -

(1) $\frac{74}{12}$ (2) 464 (3) –464 (4) $\frac{-74}{12}$

8. **The value of** $\int_0^{\pi/4} (\cos x - \sin x)dx$ -

(1) $\sqrt{2}-1$ (2) $\sqrt{2}+1$ (3) $1-\sqrt{2}$ (4) $1+\sqrt{2}$

9. **Value of** $\int_0^2 4x^3 dx + \int_0^{\pi/2} \cos x dx$ **is** -

(1) 16 (2) 15 (3) 17 (4) None

10. **The value of integral** $\int_0^{\pi/2} \sin(2x)dx$ -

(1) 0 (2) –1 (3) 1 (4) None

Answer key

Question	1	2	3	4	5	6	7	8	9	10
Answer	**3**	**4**	**3**	**4**	**1**	**2**	**4**	**1**	**3**	**3**

SOLUTIONS

1. **(3)**

$$\int \frac{dx}{(4x+5)} = \frac{1}{4}\log_e(4x+5)+c$$

2. **(4)**

$$\int \frac{dx}{\sqrt[3]{x}} = \int \frac{dx}{(x)^{1/3}} = \int x^{-1/3}dx$$

$$\frac{x^{-1/3+1}}{-\frac{1}{3}+1}+c = \frac{3}{2}(x)^{\frac{2}{3}}+c$$

3. **(3)**

$$(2x^3 - x^2 + 1)dx = \int = \int 2x^3dx - \int x^2dx + \int dx$$

$$= 2\frac{x^4}{4} - \frac{x^3}{3} + x + c$$

4. **(4)**

$$= \int x^2dx - \int \cos x dx + \int \frac{1}{x}dx$$

$$= \frac{x^{2+1}}{2+1} - \sin x + \ell nx + c$$

$$= \frac{x^3}{3} - \sin x + \ell nx + c$$

5. **(1)**

$$\int \cos^2 x dx = \int \frac{1+\cos 2x}{2}dx = \int \frac{1}{2}dx + \int \frac{\cos 2x}{2}$$

$$= \frac{1}{2}\int dx + \frac{1}{2}\int \cos 2x$$

$$= \frac{x}{2} + \frac{1}{2}\frac{\sin 2x}{2} + c$$

6. **(2)**

$$\int_0^{\pi/2} \cos x dx = [\sin x]_0^{\pi/2}$$

$$= \left[\sin\frac{\pi}{2} - \sin(0)\right] = 1$$

7. **(4)**

$$\int_2^3 x^3dx - \int_2^3 4x^2dx + \int_2^3 5xdx - \int_2^3 10dx$$

$$\left[\frac{x^4}{4}\right]_2^3 - \left[\frac{4x^3}{3}\right]_2^3 + \left[\frac{5x^2}{2}\right]_2^2 - [10x]_2^3$$

$$\left[\frac{81}{4} - \frac{16}{4}\right] - \left[\frac{108}{3} - \frac{32}{3}\right] + \left[\frac{45}{2} - \frac{20}{2}\right] - [30-20] = \frac{-74}{12}$$

8. **(1)**

$$\int_0^{\pi/4} \cos x dx - \int_0^{\pi/4} \sin x dx$$

$$= [\sin x]_0^{\pi/4} - [-\cos x]_0^{\pi/4}$$

$$= \left[\sin\frac{\pi}{4} - \sin 0\right] + \left[\cos\frac{\pi}{4} - \cos 0\right]$$

$$= \left(\frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}} - 1\right) = \left(\sqrt{2} - 1\right)$$

9. **(3)**

$$\int_0^2 (4x^3)dx + \int_0^{\pi/2} (\cos x)dx$$

$$= 4\left(\frac{x^4}{4}\right)_0^2 + (\sin x)_0^{\pi/2}$$

$$= \left[(2)^4 - 0^4\right] + \left[\sin\left(\frac{\pi}{2}\right) - \sin 0°\right]$$

$= 16 + 1 = 17$

10. **(3)**

$$\int_0^{\pi/2} \sin(2x)dx = \left(\frac{-\cos(2x)}{2}\right)_0^{\pi/2}$$

$$= \left[\frac{-\cos(2\times\frac{\pi}{2})}{2} + \frac{\cos(2\times 0)}{2}\right]$$

$$= \frac{1}{2}[+1+1] = 1$$

Average Value of Function DPP - 07

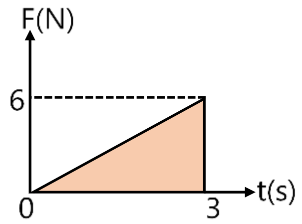
1. **If the velocity of a particle moving along x-axis is given as v = $(3t^2 - 2t)$ and at t = 0, x = 0 then calculate position of the particle at t = 2sec.**
(Hint :- change in position $\Delta x = \int v dt$)
(1) 8 (2) –8 (3) –4 (4) +4

2. **Area bounded by curve y = sin x, with x-axis, when x varies from 0 to $\frac{\pi}{2}$ is :-**
(1) 1 unit (2) 2 units (3) 3 units (4) 0

3. **Kinetic energy of a particle executing S.H.M. is $K = \frac{1}{2}m\omega^2(a^2 - x^2)$ calculate average value of kinetic energy from x = 0 to x = a.**
(1) $\frac{1}{2}m\omega^2a^2$ (2) $\frac{1}{4}m\omega^2a^2$ (3) $\frac{1}{3}m\omega^2a^2$ (4) $\frac{1}{6}m\omega^2a^2$

4. **Evaluate the $\int_{r_1}^{r_2} -\left(K\frac{q_1q_2}{r^2}\right)dr$**
(1) $kq_1q_2\left(\frac{1}{r_2} - \frac{1}{r_1}\right)$ (2) $kq_1q_2\left(\frac{1}{r_2} + \frac{1}{r_1}\right)$ (3) $kq_1q_2\left(\frac{1}{r_2^2} + \frac{1}{r_1^2}\right)$ (4) $kq_1q_2\left(\frac{1}{r_2^2} - \frac{1}{r_1^2}\right)$

5. **The figure shows an estimate force time graph for a baseball stuck by a bat. From the curve determine impulse delivered to the ball. (If $I = \int F dt$)**



(1) 18 N-s (2) 4.5 N-s (3) 9 N-s (4) None

6. **The average value of alternating current I = $I_0 \sin \omega t$ in time interval $\left[0, \frac{\pi}{\omega}\right]$** is -
(1) $\frac{2I_0}{\pi}$ (2) $2I_0$ (3) $\frac{4I_0}{\pi}$ (4) $\frac{I_0}{\pi}$

7. **If acceleration of a particle at any time is given by : a = 2t + 5, calculate the velocity after 5 s, if it starts from rest :**
(1) 50 m/s (2) 25 m/s (3) 100 m/s (4) 75 m/s

8. **Find the area under wave for y = 2x between x = 0; and x = 10**
(1) 200 unit (2) 100 unit (3) 50 unit (4) 20 unit

Answer key

Question	1	2	3	4	5	6	7	8
Answer	4	2	3	1	3	1	1	1

SOLUTIONS

1. **(4)**

$v = 3t^2 - 2t$

$$\frac{dx}{dt} = 3t^2 - 2t$$

$$\int dx = \int (3t^2 - 2t)dt$$

When $t = 0 \longrightarrow x = 0$

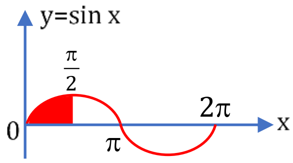
$t = 2 \longrightarrow x = ?$

$$\int_0^x dx = \int_0^2 (3t^2 - 2t)dt$$

$$x = \left[t^3 - t^2\right]_0^2$$

$x = 4$

2. **(2)**



$$\text{Area} = \int_{\pi}^{2\pi} + \sin x = (-\cos x)_{\pi}^{2\pi}$$

$$= -[\cos 2\pi - \cos \pi]$$

$= -[1 + 1] = -2$

3. **(3)**

$$\bar{K} = \frac{\int_0^a K dx}{\int_0^a dx} = \frac{\int_0^a \frac{1}{2} m\omega^2 (a^2 - x^2) dx}{a} = \frac{1}{3} m\omega^2 a^2$$

4. **(1)**

$$-\frac{kq_1 q_2}{r} \int_{r_1}^{r_2} r^{-2} dr = -kq_1 q_2 \left(\frac{r^{-1}}{-1}\right)_{r_1}^{r_2}$$

$$= K_1 q_1 q_2 \left[\frac{1}{r}\right]_{r_1}^{r_2}$$

$$= Kq_1 q_2 \left[\frac{1}{r_2} - \frac{1}{r_1}\right]$$

5. **(3)**

$I = \int F dt$ = impulse will be area under the curve

$= \frac{1}{2} \times 6 \times 3 = 9N - s$

6. **(1)**

$$I_{av} = \frac{\int_0^{\pi/\omega} I dt}{\frac{\pi}{\omega} - 0} = \frac{\omega}{\pi}\int_0^{\pi/\omega} I_0 \sin \omega t dt = \frac{\omega}{\pi}\left[\frac{I_0(-\cos \omega t)}{\omega}\right]_0^{\pi/\omega}$$

$$= -\frac{\omega}{\pi}\frac{I_0}{\omega}[\cos \pi - \cos 0] = -\frac{I_0}{\pi}[-1-1] = \frac{2I_0}{\pi}$$

7. **(1)**

a = (2t + 5)

$$\frac{dv}{dt} = (2t+5) \Rightarrow \int_0^v dv = \int_0^5 (2t+5)dt$$

$$v = 2\left(\frac{t^2}{2}\right)_0^5 + 5(t)_0^5$$

= 25 + 25 = 50 m/sec

8. **(1)**

$$\int_0^{10} y dx = \int_0^{10} (2x) dx$$

$$= 2\left[\frac{x^2}{2}\right]_0^{10}$$

= 100 units

Logarithm and Progressions DPP-08

1. **If $y^2 - 2y - 3 = 0$, find the value of y: -**

(1) 3,1 (2) –3, –1 (3) 3, –1 (4) –3,1

2. **Which of the following is Quadratic equation?**

(1) $x + 1 = 0$ (2) $x^2(2x + 3) = 0$ (3) $x(x^2 + 1) + 2$ (4) $(x - 2)^2 + 1 = 0$

3. **Sum of the roots of equations, $2x^2 - 4x + 5 = 0$ is**

(1) –2 (2) 2 (3) –4 (4) 4

4. **Find the value of $\log_{10} 1000 - \log_{10} 100$ = ...?**

(1) 3 (2) 2 (3) 1 (4) 10

5. **Solve for x : $\log(3x + 2) - \log(3x - 2) = \log 5$**

(1) –1 (2) 1 (3) $\frac{2}{3}$ (4) $-\frac{2}{3}$

6. **Find the sum of 50 Natural Numbers: -**

(1) 1250 (2) 1350 (3) 1225 (4) 1275

7. **Find $1 - \frac{1}{2} + \frac{1}{4} - \frac{1}{8} + \frac{1}{16} - \frac{1}{32} + \ldots\ldots\ldots\ldots\infty$**

(1) 2 (2) 1 (3) $\frac{2}{3}$ (4) ∞

8. **Find sum of first ten terms of given Arithmetic progression: 1+3+5+7....... Ten terms.**

(1) 100 (2) 80 (3) 95 (4) 200

9. **Find approximate value of : -**
$(1.005)^{12}$

(1) 1.005 (2) 1.060 (3) 1.025 (4) 1.020

10. **If $B_{axis} = B_{centre}\left(\frac{R^3}{\left(R^2 + x^2\right)^{3/2}}\right)$, find $\frac{B_{axis}}{B_{centre}}$ if $x << R$**

(1) $\left[1 - \frac{3}{2}\frac{x^2}{R^2}\right]$ (2) $\left[1 + \frac{3}{2}\frac{x^2}{R^2}\right]$ (3) $\left[1 + \frac{3}{2}\frac{x}{R}\right]$ (4) $\left[1 - \frac{3}{2}\frac{x}{R}\right]$

Answer Key

Question	1	2	3	4	5	6	7	8	9	10
Answer	3	4	2	3	2	4	3	1	2	1

SOLUTIONS

1. **(3)**

$y^2 - 2y - 3 = 0$

$$y = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-3)}}{2(1)} = \frac{2 \pm \sqrt{4+12}}{2}$$

$$y = \frac{2+4}{2} \text{ or } \frac{2-4}{2}$$

$y = 3$ or -1

2. **(4)**

$(x-2)^2 + 1 = 0$

$x^2 - 4x + 5 = 0$

Highest power of the variable equal to 2.

3. **(2)**

$ax^2 + bx + c = 0$

Sum of roots = $-\frac{b}{a}$

From given equation $(2x^2 - 4x + 5) = 0$

Sum of roots = $-\frac{(-4)}{2} = 2$

4. **(3)**

$\Rightarrow \log_{10}^{10^3} - \log_{10}^{10^2}$

$\Rightarrow 3\log_{10}^{10} - 2\log_{10}^{10}$ $\quad \{\log_a^a = 1\}$

$\Rightarrow 3 - 2 = 1$

5. **(2)**

$$\log\left(\frac{3x+2}{3x-2}\right) = \log 5$$

$$\left\{\log(A) - \log(B) = \log\left(\frac{A}{B}\right)\right\}$$

Comparing both sides

$$\frac{3x+2}{3x-2} = 5$$

$3x + 2 = 15x - 10$

$x = 1$

6. **(4)**

Sum first n Natural numbers

$$S_n = \frac{n(n+1)}{2}$$

$$S_n = \frac{50(51)}{2} = 1275$$

7. **(3)**

$$S_\infty = \frac{a}{1-r} \qquad \begin{cases} a = 1 \\ r = -\dfrac{1/2}{2} = -\dfrac{1/4}{1/2} = -\dfrac{1}{2} \end{cases}$$

$$S_\infty = \frac{1}{1-\left(-\frac{1}{2}\right)} = \frac{1}{1+\frac{1}{2}}$$

$$= \frac{2}{3}$$

8. **(1)**

a = 1, d = 3 – 1 = 5 – 3 = 2, n = 10

$$S_n = \frac{10}{2}\left[2(1)+(10-1)(2)\right]$$

= 5 [2 + 18] = 100

9. **(2)**

$(1.005)^{12} = (1+0.005)^{12}$ $\{(1+x)^n = 1+nx$; when x << R$\}$

$\therefore (1 + 0.005)^{12} = 1 + 12(0.005)$

= 1.060

10. **(1)**

$$\frac{B_{axis}}{B_{centre}} = \frac{R^3}{\left(R^2+x^2\right)^{3/2}} = \frac{R^3}{R^3\left(1+\frac{x^2}{R^2}\right)^{3/2}}$$

$$\left(1+\frac{x^2}{R^2}\right)^{-3/2} = \left[1+\left(-\frac{3}{2}\right)\frac{x^2}{R^2}\right] \qquad \left(\frac{x}{R} << 1\right)$$

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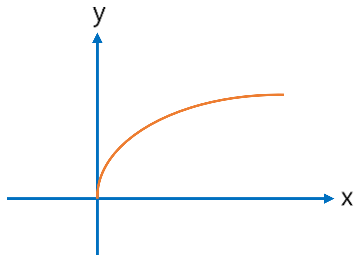
Graphs - Parabola, Rectangular Hyperbola, Exponential Functions DPP-09

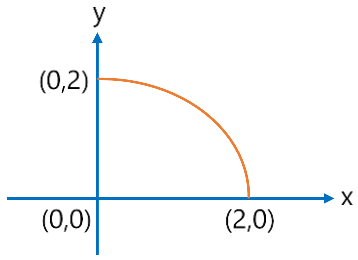
1. Which of the following equation is the best representation of the given graph?

(1) $y = 2x^2$
(2) $x = 2y^2$
(3) $y = -2x^2$
(4) $x = -2y^2$



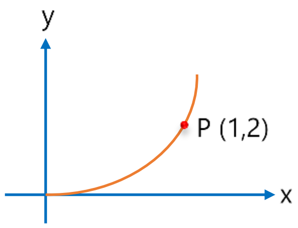
2. Which of the following equation is the best representation of the given graph?

(1) $x + y = 2$
(2) $x^2 + y^2 = 4$
(3) $x^2 + y^2 = 2$
(4) $x^2 + y = 2$

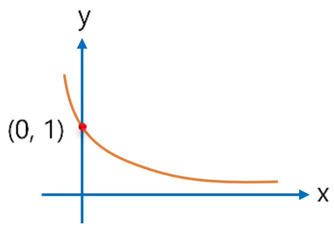


3. The equation of graph shown in figure is $y = 3x^2$. The slope of graph at point P is:

(1) 1
(2) 2
(3) 3
(4) 6



4. Which of the following equation is the best representation of the given graphs?



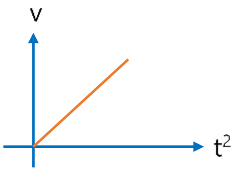
(1) $x = \frac{1}{y}$

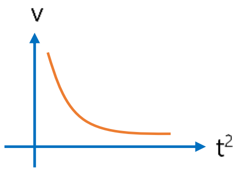
(2) $y = e^{-x}$

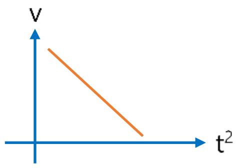
(3) $y = e^x$

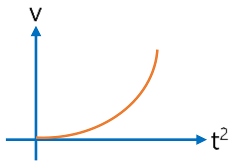
(4) $y = \log_e x$

5. **If velocity v varies with time t as $v = 2t^2$, then the plot between v and t^2 will be given as: -**

(1) 

(2) 

(3) 

(4) 

6. $\mathbf{\frac{x^2}{A^2} + \frac{v^2}{A^2\omega^2} = 1}$ **is a equation of: -**

(1) Ellipse

(2) Circle

(3) Parabola

(4) Rectangular Hyperbola

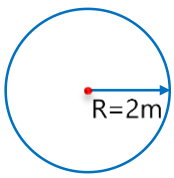
7. **Find area of given circle: -**

(1) 2π

(2) 4π

(3) $\frac{\pi}{4}$

(4) $\frac{\pi}{2}$



8. **Find the surface area of sphere and volume of sphere of radius, r = 2m.**

(1) $16\pi m^2, \frac{32\pi}{3} m^3$

(2) $\frac{32\pi}{3} m^2, 16\pi m^3$

(3) $16\pi m^2, \frac{16\pi}{3} m^3$

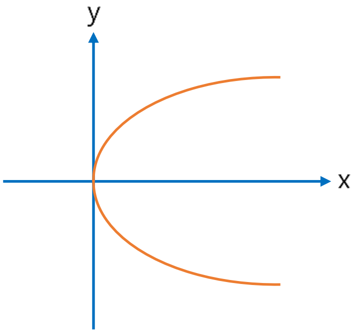
(4) $\frac{16\pi}{3} m^2, \frac{32\pi}{3} m^3$

Answer Key

Question	1	2	3	4	5	6	7	8
Answer	2	2	4	2	1	1	2	1

SOLUTIONS

1. **(2)**



Equation of these type of parabolas are $y^2 = x$

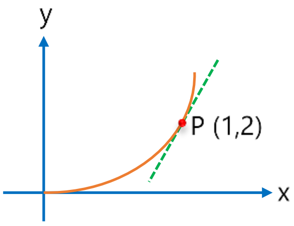
2. **(2)**

Equation of circle $\Rightarrow x^2 + y^2 = r^2$ {when centre of circle is (0, 0)}

In given diagram radius of circle, r = 2

$\therefore$ Equation of circle $\Rightarrow x^2 + y^2 = 4$

3. **(4)**



$y = 3x^2$

$$\frac{dy}{dx} = 6x$$

Point P (1, 2)

$$\frac{dy}{dx} = 6(1) = 6$$

4. **(2)**

$y = e^{-x}$

5. **(1)**

$\therefore$ $V = 2t^2$ (given eq^n)

$y = m(x)$ (general eq^n)

$\therefore$ Straight line

6. **(1)**

$\because \frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is an equation of ellipse.

7. **(2)**

Area of circle = πr^2

$= \pi(2)^2 = 4\pi$

8. **(1)**

Area = $4\pi r^2$

$= 4\pi(2)^2$

$= 16\pi m^2$

Volume = $\frac{4}{3}\pi r^3$

$= \frac{4}{3}\pi(2)^3$

$= \frac{32\pi}{3} m^3$