



**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)  $\tan (-30^\circ)$

(ii)  $\cos 150^\circ$

(iii)  $\sin 210^\circ$

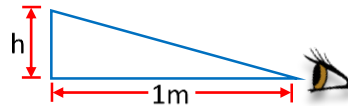
(1)  $\frac{1}{\sqrt{3}}, \frac{\sqrt{3}}{2}, \frac{1}{2}$

(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  $1.8^\circ$  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)  $\pi$  m

(3) 0.031 cm

(4) 0.31 m

4. Convert the angle from degree to radian :

(a)  $210^\circ$

(b)  $315^\circ$

(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)  $135^\circ, 210^\circ$

(2)  $210^\circ, 135^\circ$

(3)  $225^\circ, 240^\circ$

(4)  $135^\circ, 225^\circ$

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

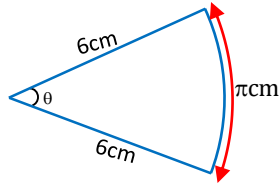
(2) 4 and 2

(3) 6 and 0

(4) 6 and 2

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

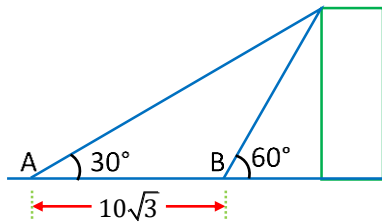
- (1)  $60^\circ$
- (2)  $30^\circ$
- (3)  $90^\circ$
- (4)  $15^\circ$



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

- (1)  $3/2$
- (2)  $1/2$
- (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  $30^\circ$  from a place A and becomes  $60^\circ$  from another place B that is  $10\sqrt{3}$  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  $\sin (37^\circ) \cos (53^\circ)$  is -

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

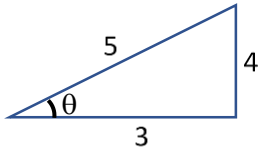


**Answer key**

| 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)  $\tan(-30^\circ) = -\tan 30^\circ = -\frac{1}{\sqrt{3}}$

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

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

3. (1)

$\theta$  is very small

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

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

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

$$\therefore h = 0.031 \text{ m}$$

4. (1)

(a)  $\frac{210^\circ \times \pi}{180^\circ} = \frac{7\pi}{6}$

(b)  $\frac{315^\circ \times \pi}{180^\circ} = \frac{7\pi}{4}$

5. (1)

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

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  $\cos\theta = -1$

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

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

8. (2)

$$\theta = \frac{s}{r} = \frac{\pi \text{ cm}}{6 \text{ cm}} = \frac{\pi}{6} \text{ rad} = 30^\circ$$

9. (4)

$$= 2(\sin 15^\circ + \sin 75^\circ)^2$$

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

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

$$= 2[1 + \sin 30^\circ] \quad (\because 2\sin \theta \cos \theta = \sin 2\theta)$$

$$= 3$$

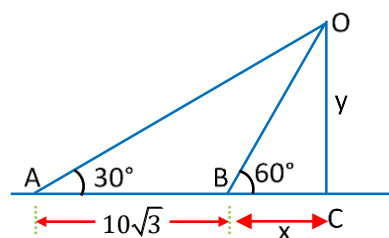
10. (4)

For  $\triangle BCO$

$$\tan 60^\circ = \frac{y}{x}$$

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

For  $\triangle ACO$



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

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

$$y + 30 = 3y$$

$$y = 15\text{m}$$

**11. (1)**

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

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

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

**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)  $+10$

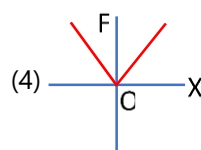
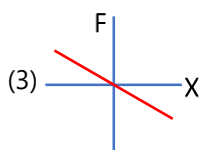
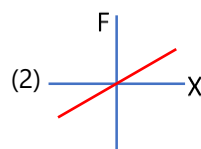
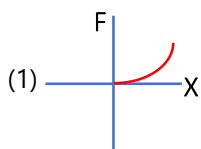
2. Calculate the distance between two points  $(0, -1, 1)$  and  $(3, 3, 13)$ .

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

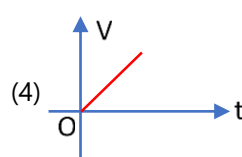
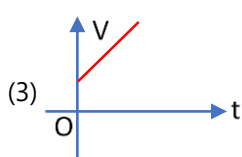
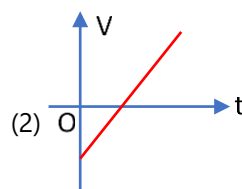
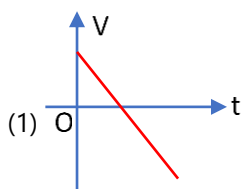
3. The slope of straight line  $2y = 3x+5$ ;

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

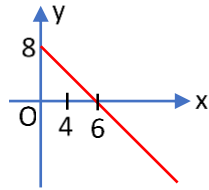
4. The spring force is given by  $F = -kx$ , here  $k$  is a constant and  $x$  is the deformation of spring. The  $F$ - $x$  graph is -



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



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



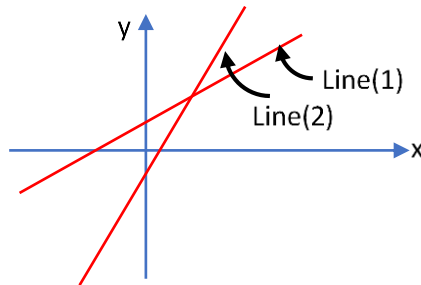
(1)  $6x + 8y = 15$

(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.

∴ According to distance formula

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

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

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

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

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

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

$$\Rightarrow (a - 2)(a + 10) = 0 \Rightarrow (a = 2) \text{ and } (a = -10)$$

$$\therefore a = 2$$

2. (4)

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

$$\text{and } Q(x_2, y_2, z_2) = (3, 3, 13)$$

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)

$$2y = 3x + 5 \text{ (given equation) ... (i)}$$

$$y = mx + c \text{ (general equation) ... (ii)}$$

Comparing equation (i) and (ii)

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

4. (3)

$$F = -kx \text{ (given equation) ... (i)}$$

$$y = mx + C \text{ (general equation) ... (ii)}$$

Comparing Both equations

$$\text{Slope} = m = -K; \text{ Negative slope}$$

$$\text{Intercept} = C = 0; \text{ So line passing through origin}$$

5. (2)

$$v = 2t - 3$$

$$y = mx + c$$

$$m = 2; c = -3$$

6. (4)

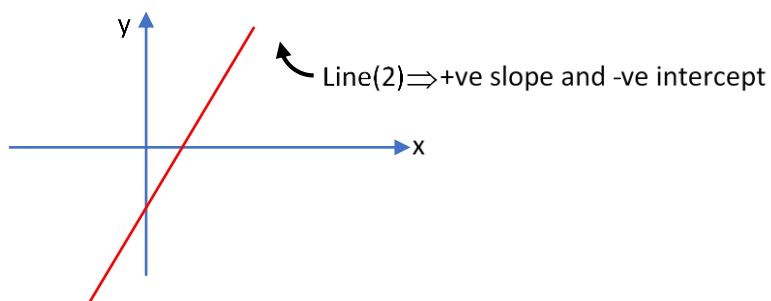
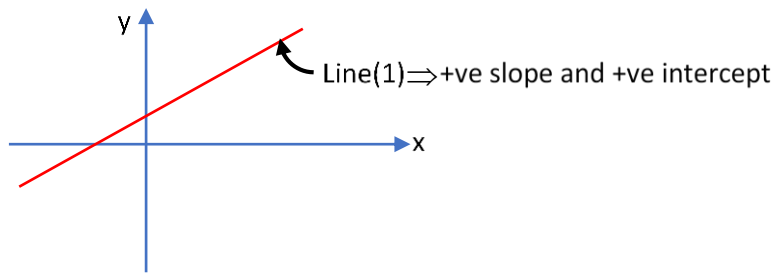
$$C = 8, m = \frac{8}{6} = \frac{4}{3}$$

$$y = mx + c$$

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

$$\therefore 3y = 4x + 24$$

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)  $\frac{4}{x^2}$

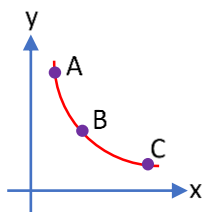
3. If  $y = \log_e x + \sin x + e^x$  then  $\frac{dy}{dx}$  is -

- (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

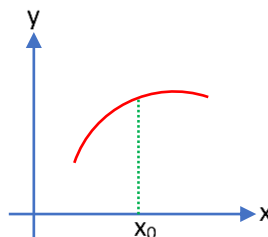
7. Find differentiation of  $y$  w.r.t.  $x$  -

If  $y = 4 \ln x + \cos x$

- (1)  $\frac{4}{x} + \sin x$                                       (2)  $4 \ln x - \sin x$                                       (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**

|                 |   |   |   |   |   |   |   |   |
|-----------------|---|---|---|---|---|---|---|---|
| <b>Question</b> | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| <b>Answer</b>   | 2 | 3 | 3 | 2 | 2 | 4 | 3 | 1 |

**SOLUTIONS**

1. (2)

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

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

2. (3)

$$\begin{aligned} \frac{d}{dx} \left( \frac{4}{x^3} \right) &= \frac{d}{dx} (4x^{-3}) \\ &= 4(-3)x^{-4} = \frac{-12}{x^4} \end{aligned}$$

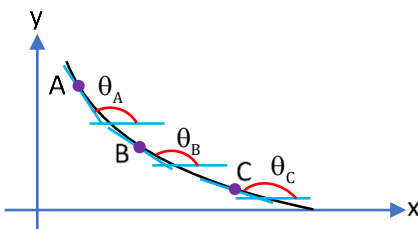
3. (3)

$$\begin{aligned} \frac{dy}{dx} &= \frac{d}{dx} (\log_e x) + \frac{d}{dx} (\sin x) + \frac{d}{dx} (e^x) \\ &= \frac{1}{x} + \cos x + e^x \end{aligned}$$

4. (2)

$$\begin{aligned} &\Rightarrow \frac{d}{dx} \left( x^3 + \frac{4}{3}x^2 - 5x + 1 \right) \\ &\Rightarrow dx(x^3) + \frac{d}{dx} \left( \frac{4}{3}x^2 \right) - \frac{d}{dx} (5x) + \frac{d}{dx} (1) \\ &= 3x^2 + \frac{8}{3}x - 5 \end{aligned}$$

5. (2)



$$\therefore \theta_A < \theta_B < \theta_C \text{ (all are obtuse)}$$

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

$$\Rightarrow m_A < m_B < m_C$$

6. (4)

$$y = a \sin x + b \cos x \quad \dots\dots(i)$$

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

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

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

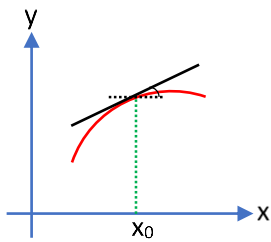
$$= a^2 \sin^2 x + b^2 \cos^2 x + 2a \sin x b \cos x + a^2 \cos^2 x + b^2 \sin^2 x - 2a \cos x b \sin x$$
$$= a^2 + b^2 = \text{constant}$$

7. (3)

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

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

8. (1)



**Rules of Differentiation - Chain Rule      DPP - 04**

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

(1)  $4x+5$                       (2) 3                              (3)  $4x+3$                       (4)  $x+3$
- 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)  $\frac{-24x-31}{(4x+5)^2}$
- Find the first derivative of  $y = x \sin x$ 

(1)  $-x \cos x + \sin x$                       (2)  $-x \cos x + x^2 \sin x$                       (3)  $x \sin x + \cos x$                       (4)  $x \cos x + \sin x$
- Find value of  $\frac{dy}{dx}$ , If  $y = 2 \cos(\sqrt{x})$ 

(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)  $\frac{-1}{\sqrt{x}} \sin(\sqrt{x})$
- $\frac{d}{dx}(e^{100}) = \dots\dots\dots$ 

(1)  $e^{100}$                               (2) 0                              (3)  $100e^{999}$                               (4) None of these
- If  $y = x^3 \cos x$  then  $\frac{dy}{dx} = \dots\dots\dots$ 

(1)  $x^2(3 \cos x - x \sin x)$                       (2)  $x^2(3 \cos x + x \sin x)$                       (3)  $3x^2 \cos x + x^3 \sin x$                       (4) None of these
- If  $y = \sin x$  &  $x = 3t$  then  $\frac{dy}{dt}$  will be

(1)  $3 \cos(x)$                               (2)  $\cos x$                               (3)  $-3 \cos(x)$                               (4)  $-\cos x$
- 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)  $\frac{3x \sec^2 x - 3 \tan x}{\tan^2 x}$
- If  $y = 2 \sin(\omega t + \phi)$  where  $\omega$  and  $\phi$  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)  $1+2\sin^2x$

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

(3)  $\sin^2x+\cos^2x$

(4)  $1-2\sin^2x$

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.  $t$

$y = \ln(t^2 + t)$

(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**

|                 |   |   |   |   |   |   |   |   |   |    |    |    |    |    |
|-----------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|
| <b>Question</b> | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| <b>Answer</b>   | 3 | 1 | 4 | 4 | 2 | 1 | 1 | 2 | 3 | 4  | 1  | 2  | 3  | 4  |

**SOLUTIONS**

1. (3)

$$\begin{aligned}\frac{dy}{dx} &= \frac{d}{dx}(x-1)(2x+5) \\ &= (x-1)[2] + (2x+5)(1) \\ &= 2x - 2 + 2x + 5 = 4x + 3\end{aligned}$$

2. (1)

$$\begin{aligned}\frac{dy}{dx} &= \frac{d(3x+4)}{dx(4x+5)} \\ &= \frac{(4x+5)\frac{d}{dx}(3x+4) - (3x+4)\frac{d}{dx}(4x+5)}{(4x+5)^2} \\ &= \frac{(4x+5)(3) - (3x+4)(4)}{(4x+5)^2} = \frac{-1}{(4x+5)^2}\end{aligned}$$

3. (4)

$$\begin{aligned}\frac{dy}{dx} &= \frac{d}{dx}(x \sin x) \\ &= x \frac{d}{dx}(\sin x) + \sin x \frac{d}{dx}(x) \\ &= x(\cos x) + \sin x\end{aligned}$$

4. (4)

$$\begin{aligned}\text{Let } U &= x^{1/2}; & y &= 2\cos(U) \\ \frac{dv}{dx} &= \frac{1}{2}x^{-1/2} & \frac{dy}{dv} &= -2\sin u \\ \frac{dy}{dx} &= \frac{dv}{dx} \times \frac{dy}{dv} & &= \frac{1}{2}x^{-1/2} \times (-2\sin v) \\ & & &= -\frac{1}{\sqrt{x}}\sin(\sqrt{x})\end{aligned}$$

5. (2)

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

6. (1)

$$y = x^3 \cos x$$

apply product rule

$$\begin{aligned}\frac{dy}{dx} &= 3x^2 \cos x - x^3 \sin x \\ &= x^2(3 \cos x - x \sin x)\end{aligned}$$

7. (1)

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

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

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

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)

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

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

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

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

10. (4)

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

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

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

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

11. (1)

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

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

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

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

12. (2)

$$u = 3x \quad y = 4\sin(u)$$

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

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

$$= 12\cos(3x)$$

13. (3)

$$u = t^2 + t \quad y = \ln(u)$$

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

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

14. (4)

$$u = (x^3 + 1) \quad y = (u^3)$$

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

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

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



**Concept of Maxima and Minima DPP - 05**

1. For a straight line  $3y = \sqrt{3}x + 3$ . Choose correct alternative(s)
- (1)  $\frac{dy}{dx} = \tan 30^\circ$       (2)  $\frac{dx}{dy} = \cot 30^\circ$       (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)  $8\pi$  units/s      (2)  $4\pi$  units/s      (3)  $2\pi$  units/s      (4)  $\pi$  units/s
3. The slope of the tangent to the curve  $y = \ln(\sin x)$  at  $x = \frac{3\pi}{4}$  is
- (1) 1      (2) -1      (3)  $\ln\sqrt{2}$       (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  $t = 4$ sec.
- (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  $y = \sin x + \cos x$  then  $\frac{d^2y}{dx^2}$  is :-
- (1)  $\sin x - \cos x$       (2)  $\cos x - \sin x$       (3)  $-(\sin x + \cos x)$       (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

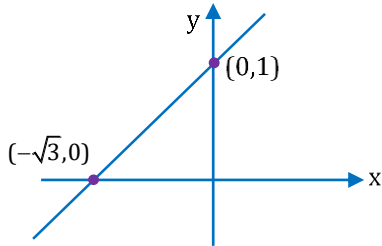


**Answer key**

| Question | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|----------|---|---|---|---|---|---|---|---|---|
| Answer   | 4 | 1 | 2 | 1 | 3 | 3 | 3 | 3 | 2 |

**SOLUTIONS**

1. (4)



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

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

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

(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

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

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

$$= 8\pi$$

3. (2)

$$y = \ln(\sin x)$$

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

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

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

4. (1)

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

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

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

$$i_{t=5} = 23$$

5. (3)

$$A = 4t^2 + 2t$$

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

$$\text{at } t = 4 \text{ sec.}$$

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

6. (3)

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

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

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

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)

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

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

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

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

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

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

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

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

9. (2)

Step-1

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

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

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

Step-2

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

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

$$\therefore x = 8 \text{ or } x = 4$$

Step-3

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

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

$$\text{at } x = 8, \text{ minima}$$

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

$$\text{at } x = 4 \text{ maxima}$$



**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)  $x^3 - \sin x + \ln x + c$  (2)  $2x + \sin x + \ln x + c$  (3)  $\frac{x^3}{3} + \sin x + \ln x + c$  (4)  $\frac{x^3}{3} - \sin x + \ln x + c$
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**

|                 |   |   |   |   |   |   |   |   |   |    |
|-----------------|---|---|---|---|---|---|---|---|---|----|
| <b>Question</b> | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| <b>Answer</b>   | 3 | 4 | 3 | 4 | 1 | 2 | 4 | 1 | 3 | 3  |

**SOLUTIONS**

1. (3)

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

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)

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

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

4. (4)

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

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

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

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)

$$\begin{aligned} & \int_2^3 x^3 dx - \int_2^3 4x^2 dx + \int_2^3 5x dx - \int_2^3 10 dx \\ & \left[ \frac{x^4}{4} \right]_2^3 - \left[ \frac{4x^3}{3} \right]_2^3 + \left[ \frac{5x^2}{2} \right]_2^3 - [10x]_2^3 \\ & \left[ \frac{81}{4} - \frac{16}{4} \right] - \left[ \frac{108}{3} - \frac{32}{3} \right] + \left[ \frac{45}{2} - \frac{20}{2} \right] - [30 - 20] = \frac{-74}{12} \end{aligned}$$

8. (1)

$$\begin{aligned} & \int_0^{\pi/4} \cos x dx - \int_0^{\pi/4} \sin x dx \\ & = [\sin x]_0^{\pi/4} - [-\cos x]_0^{\pi/4} \\ & = \left[ \sin \frac{\pi}{4} - \sin 0 \right] + \left[ \cos \frac{\pi}{4} - \cos 0 \right] \\ & = \left( \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}} - 1 \right) = (\sqrt{2} - 1) \end{aligned}$$

9. (3)

$$\begin{aligned} & \int_0^2 (4x^3) dx + \int_0^{\pi/2} (\cos x) dx \\ & = 4 \left( \frac{x^4}{4} \right)_0^2 + (\sin x)_0^{\pi/2} \\ & = [(2)^4 - 0^4] + \left[ \sin \left( \frac{\pi}{2} \right) - \sin 0^\circ \right] \\ & = 16 + 1 = 17 \end{aligned}$$

10. (3)

$$\begin{aligned} & \int_0^{\pi/2} \sin(2x) dx = \left( \frac{-\cos(2x)}{2} \right)_0^{\pi/2} \\ & = \left[ \frac{-\cos(2 \times \frac{\pi}{2})}{2} + \frac{\cos(2 \times 0)}{2} \right] \\ & = \frac{1}{2} [+1 + 1] = 1 \end{aligned}$$



**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  $t = 2$  sec.

(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

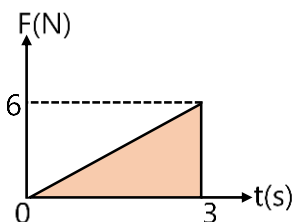
3. Kinetic energy of a particle executing S.H.M. is  $K = \frac{1}{2}m\omega^2(a^2 - x^2)$  calculate average value of kinetic energy from  $x = 0$  to  $x = a$ .

- (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  $\int_{r_1}^{r_2} -\left(K \frac{q_1 q_2}{r^2}\right) dr$

- (1)  $kq_1 q_2 \left(\frac{1}{r_2} - \frac{1}{r_1}\right)$                                       (2)  $kq_1 q_2 \left(\frac{1}{r_2} + \frac{1}{r_1}\right)$                                       (3)  $kq_1 q_2 \left(\frac{1}{r_2^2} + \frac{1}{r_1^2}\right)$                                       (4)  $kq_1 q_2 \left(\frac{1}{r_2^2} - \frac{1}{r_1^2}\right)$

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**

|                 |   |   |   |   |   |   |   |   |
|-----------------|---|---|---|---|---|---|---|---|
| <b>Question</b> | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| <b>Answer</b>   | 4 | 2 | 3 | 1 | 3 | 1 | 1 | 1 |

**SOLUTIONS**

1. (4)

$$v = 3t^2 - 2t$$

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

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

$$\text{When } t = 0 \longrightarrow x = 0$$

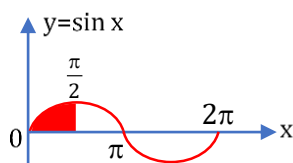
$$t = 2 \longrightarrow x = ?$$

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

$$x = [t^3 - t^2]_0^2$$

$$x = 4$$

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)

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

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

6. (1)

$$I_{av} = \frac{\int_0^{\pi/\omega} I dt}{\frac{\pi}{\omega} - 0} = \frac{\omega}{\pi} \int_0^{\pi/\omega} I_0 \sin \omega t dt = \frac{\omega}{\pi} \left[ \frac{I_0 (-\cos \omega t)}{\omega} \right]_0^{\pi/\omega}$$
$$= -\frac{\omega I_0}{\pi \omega} [\cos \pi - \cos 0] = -\frac{I_0}{\pi} [-1 - 1] = \frac{2I_0}{\pi}$$

7. (1)

$$a = (2t + 5)$$

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

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

$$= 25 + 25 = 50 \text{ m/sec}$$

8. (1)

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

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

$$= 100 \text{ units}$$

**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  $\log_{10} 1000 - \log_{10} 100 = \dots\dots\dots?$**   
 (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  $1 - \frac{1}{2} + \frac{1}{4} - \frac{1}{8} + \frac{1}{16} - \frac{1}{32} + \dots\dots\dots\infty$**   
 (1) 2                      (2) 1                      (3)  $\frac{2}{3}$                       (4)  $\infty$
8. **Find sum of first ten terms of given Arithmetic progression:  $1+3+5+7+\dots\dots$  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  $B_{axis} = B_{centre} \left( \frac{R^3}{(R^2 + x^2)^{3/2}} \right)$ , find  $\frac{B_{axis}}{B_{centre}}$  if  $x \ll R$**   
 (1)  $\left[ 1 - \frac{3x^2}{2R^2} \right]$                       (2)  $\left[ 1 + \frac{3x^2}{2R^2} \right]$                       (3)  $\left[ 1 + \frac{3x}{2R} \right]$                       (4)  $\left[ 1 - \frac{3x}{2R} \right]$

### 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)

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

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

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

$$y = 3 \text{ or } -1$$

2. (4)

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

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

Highest power of the variable equal to 2.

3. (2)

$$ax^2 + bx + c = 0$$

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

$$\text{From given equation } (2x^2 - 4x + 5) = 0$$

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

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)

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

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

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

8. (1)

$$a = 1, d = 3 - 1 = 5 - 3 = 2, n = 10$$

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

$$= 5 [2 + 18] = 100$$

9. (2)

$$(1.005)^{12} = (1+0.005)^{12}$$

$$\{(1+x)^n = 1+nx; \text{ when } x \ll R\}$$

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

$$= 1.060$$

10. (1)

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

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

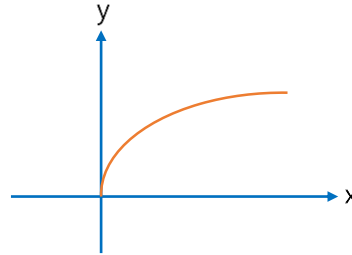


**Graphs - Parabola, Rectangular Hyperbola, Exponential Functions**

**DPP-09**

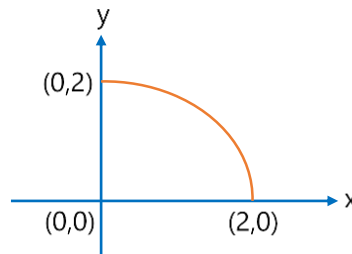
1. Which of the following equation is the best representation of the given graph?

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



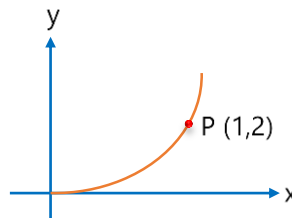
2. Which of the following equation is the best representation of the given graph?

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

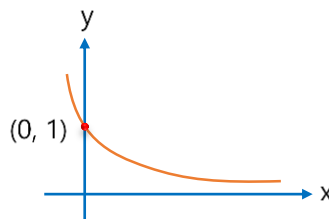


3. The equation of graph shown in figure is  $y = 3x^2$ . The slope of graph at point P is:

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

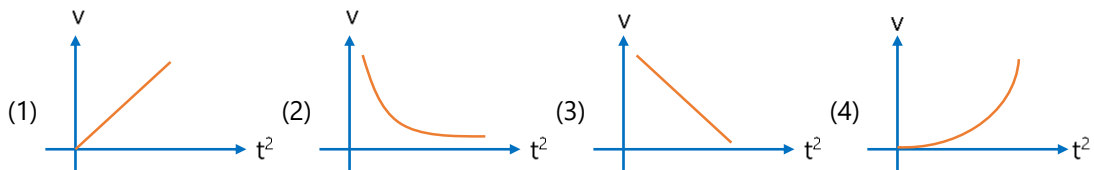


4. Which of the following equation is the best representation of the given graphs?



- (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: -

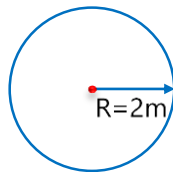


6.  $\frac{x^2}{A^2} + \frac{v^2}{A^2\omega^2} = 1$  is a equation of: -

- (1) Ellipse
- (2) Circle
- (3) Parabola
- (4) Rectangular Hyperbola

7. Find area of given circle: -

- (1)  $2\pi$
- (2)  $4\pi$
- (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)  $\frac{16\pi}{3} m^2, \frac{32\pi}{3} m^3$

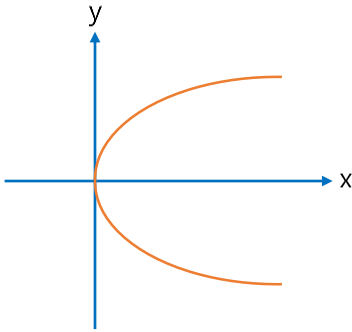


**Answer Key**

| 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  $y^2 = x$

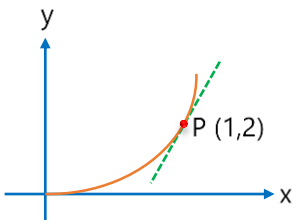
2. (2)

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)

$$\therefore V = 2t^2 \quad (\text{given eq}^n)$$

$$y = m(x) \quad (\text{general eq}^n)$$

$\therefore$  Straight line

6. (1)

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

7. (2)

Area of circle =  $\pi r^2$

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

8. (1)

Area =  $4\pi r^2$

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

$$= 16\pi \text{m}^2$$

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

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

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