

# MATHEMATICS



## Important Questions

### Multiple Choice questions-

1. The rate of change of the area of a circle with respect to its radius  $r$  at  $r = 6$  cm is:

- (a)  $10\pi$
- (b)  $12\pi$
- (c)  $8\pi$
- (d)  $11\pi$

2. The total revenue received from the sale of  $x$  units of a product is given by  $R(x)=3x^2+36x+5$ . The marginal revenue, when  $x = 15$  is:

- (a) 116
- (b) 96
- (c) 90
- (d) 126.

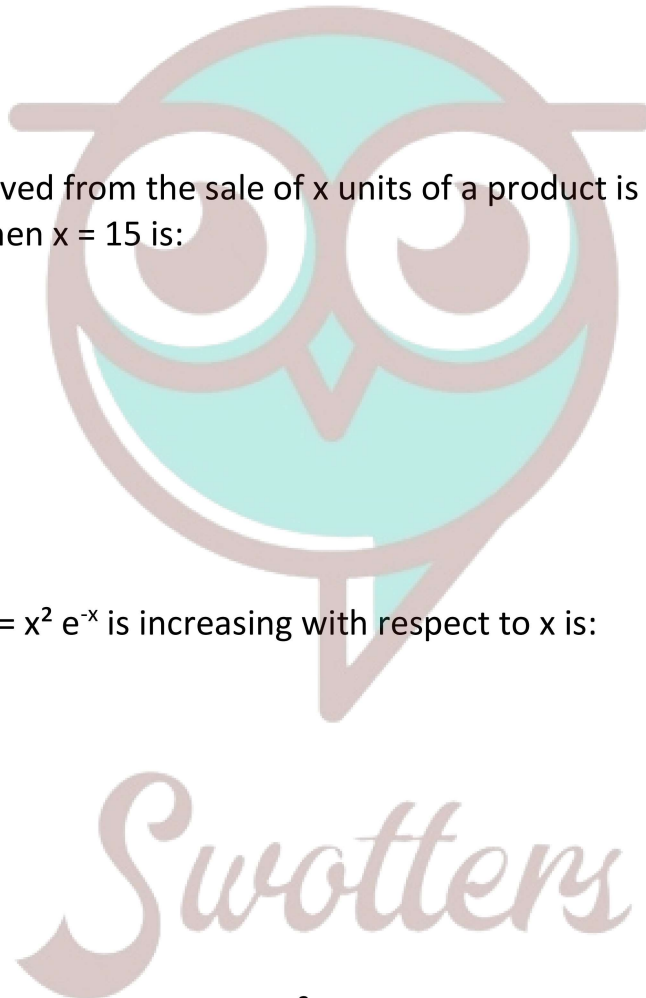
3. The interval in which  $y = x^2 e^{-x}$  is increasing with respect to  $x$  is:

- (a)  $(-\infty, \infty)$
- (b)  $(-2,0)$
- (c)  $(2, \infty)$
- (d)  $(0, 2)$ .

4. The slope of the normal to the curve  $y = 2x^2 + 3 \sin x$  at  $x = 0$  is

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

5. The line  $y = x + 1$  is a tangent to the curve  $y^2 = 4x$  at the point:



- (a) (1, 2)
- (b) (2, 1)
- (c) (1, -2)
- (d) (-1, 2).

6. If  $f(x) = 3x^2 + 15x + 5$ , then the approximate value of  $f(3.02)$  is:

- (a) 47.66
- (b) 57.66
- (c) 67.66
- (d) 77.66.

7. The approximate change in the volume of a cube of side  $x$  meters caused by increasing the side by 3% is:

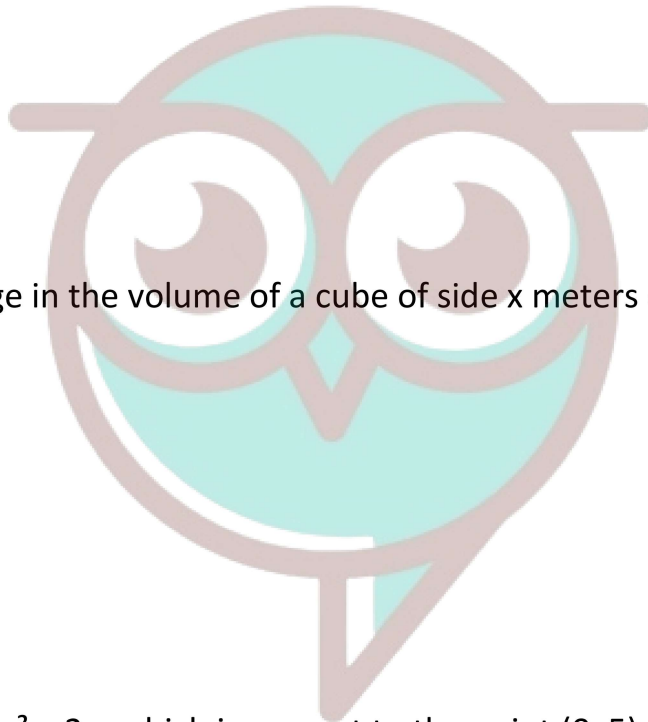
- (a)  $0.06 x^3 \text{ m}^3$
- (b)  $0.6 x^3 \text{ m}^3$
- (c)  $0.09 x^3 \text{ m}^3$
- (d)  $0.9 x^3 \text{ m}^3$

8. The point on the curve  $x^2 = 2y$ , which is nearest to the point  $(0, 5)$ , is:

- (a)  $(2\sqrt{2}, 4)$
- (b)  $(2\sqrt{2}, 0)$
- (c)  $(0, 0)$
- (d)  $(2, 2)$ .

9. For all real values of  $x$ , the minimum value of  $\frac{1-x+x^2}{1+x+x^2}$  is

- (a) 0
- (b) 1
- (c) 3



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(d)  $\frac{1}{3}$

10. The maximum value of  $[x(x-1)+1]^{1/3}$ ,  $0 \leq x \leq 1$  is

(a)  $(\frac{1}{3})^{1/3}$

(b)  $\frac{1}{2}$

(c) 1

(d) 0

### Very Short Questions:

1. For the curve  $y = 5x - 2x^3$ , if increases at the rate of 2 units/sec., find the rate of change of the slope of the curve when  $x = 3$ . (C.B.S.E. 2017)
2. Without using the derivative, show that the function  $f(x) = 7x - 3$  is a strictly increasing function in R.
3. Show that function:  
 $f(x) = 4x^3 - 18x^2 - 27x - 7$  is always increasing in R. (C.B.S.E. 2017)
4. Find the slope of the tangent to the curve:  
 $x = at^2$ ,  $y = 2at$  at  $t = 2$ .
5. Find the maximum and minimum values, if any, of the following functions without using derivatives:
  - (i)  $f(x) = (2x-1)^2 + 3$
  - (ii)  $f(x) = 16x^2 - 16x + 28$
  - (iii)  $f(x) = -|x+1| + 3$
  - (iv)  $f(x) = \sin 2x + 5$
  - (v)  $f(x) = \sin(\sin x)$ .
6. A particle moves along the curve  $x^2 = 2y$ . At what point, ordinate increases at die same rate as abscissa increases? (C.B.S.E. Sample Paper 2019-20)

### Long Questions:

1. A ladder 13 m long is leaning against a vertical wall. The bottom of the ladder is dragged away from the wall along the ground at the rate of 2 cm/sec. How fast is the height on the wall decreasing when the foot of the ladder is 5 m away from the wall? (C.B.S.E. Outside Delhi 2019)
2. Find the angle of intersection of the curves  $x^2 + y^2 = 4$  and  $(x - 2)^2 + y^2 = 4$ , at the point in the first quadrant (C.B.S.E. 2018 C)
3. Find the intervals in which the function:  $f(x) = -2x^3 - 9x^2 - 12x + 1$  is (i) Strictly increasing (ii) Strictly decreasing. (C.B.S.E. 2018 C)
4. A window is in the form of a rectangle surmounted by a semicircular opening. The total perimeter of the window is 10 meters. Find the dimensions of the window to admit maximum light through the whole opening. (C.B.S.E. 2018 C)

### Assertion and Reason Questions:

1. Two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

- a) Both A and R are true and R is the correct explanation of A.
- b) Both A and R are true but R is not the correct explanation of A.
- c) A is true but R is false.
- d) A is false and R is true.
- e) Both A and R are false.

**Assertion(A):** For each real 't', then exist a point C in  $[t, t+\pi]$  such that  $f'(C) = 0$

**Reason (R):**  $f(t)=f(t+2\pi)$  for each real t

2. Two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes(a), (b), (c) and (d) as given below.

- a) Both A and R are true and R is the correct explanation of A.
- b) Both A and R are true but R is not the correct explanation of A.
- c) A is true but R is false.
- d) A is false and R is true.
- e) Both A and R are false.

**Assertion (A):** One root of  $x^3 - 2x^2 - 1 = 0$  and lies between 2 and 3.

**Reason(R):** If  $f(x)$  is continuous function and  $f [a], f[b]$  have opposite signs then at least one or odd number of roots of  $f(x)=0$  lies between a and b.

## Case Study Questions:

1. An architecture design a auditorium for a school for its cultural activities. The floor of the auditorium is rectangular in shape and has a fixed perimeter  $P$ .



Based on the above information, answer the following questions.

i. If  $x$  and  $y$  represents the length and breadth of the rectangular region, then relation between the variable is.

- a.  $x + y = P$
- b.  $x^2 + y^2 = P^2$
- c.  $2(x + y) = P$
- d.  $x + 2y = P$

ii. The area ( $A$ ) of the rectangular region, as a function of  $x$ , can be expressed as.

- a.  $A = px + \frac{x}{2}$
- b.  $A = \frac{px+x^2}{2}$
- c.  $A = \frac{px-2x^2}{2}$
- d.  $A = \frac{x^2}{2} + px^2$

iii. School's manager is interested in maximising the area of floor

'A' for this to be happen, the value of x should be.

a.  $P$

b.  $\frac{P}{2}$

c.  $\frac{P}{3}$

d.  $\frac{P}{4}$

iv. The value of y, for which the area of floor is maximum, is.

a.  $\frac{P}{2}$

b.  $\frac{P}{3}$

c.  $\frac{P}{4}$

d.  $\frac{P}{16}$

v. Maximum area of floor is.

a.  $\frac{P^2}{16}$

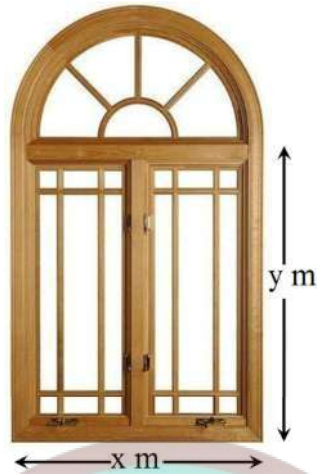
b.  $\frac{P^2}{64}$

c.  $\frac{P^2}{4}$

d.  $\frac{P^2}{28}$



2. Rohan, a student of class XII, visited his uncle's flat with his father. He observe that the window of the house is in the form of a rectangle surmounted by a semicircular opening having perimeter 10m as shown in the figure.



Based on the above information, answer the following questions.

i. If  $x$  and  $y$  represents the length and breadth of the rectangular region, then relation between  $x$  and  $y$  can be represented as.

a.  $x + y + \frac{\pi}{2} = 10$

b.  $x + 2y + \frac{\pi x}{2} = 10$

c.  $2x + 2y = 10$

d.  $x + 2y + \frac{\pi}{2} = 10$

ii. The area ( $A$ ) of the window can be given by.

a.  $A = x - \frac{x^3}{8} - \frac{x^2}{2}$

b.  $A = 5x - \frac{x^2}{8} - \frac{\pi x^2}{8}$

c.  $A = x + \frac{\pi x^3}{8} - \frac{3x^2}{8}$

d.  $A = 5x + \frac{x^3}{2} + \frac{\pi x^2}{8}$



iii. Rohan is interested in maximizing the area of the whole window, for this to happen, the value of  $x$  should be.

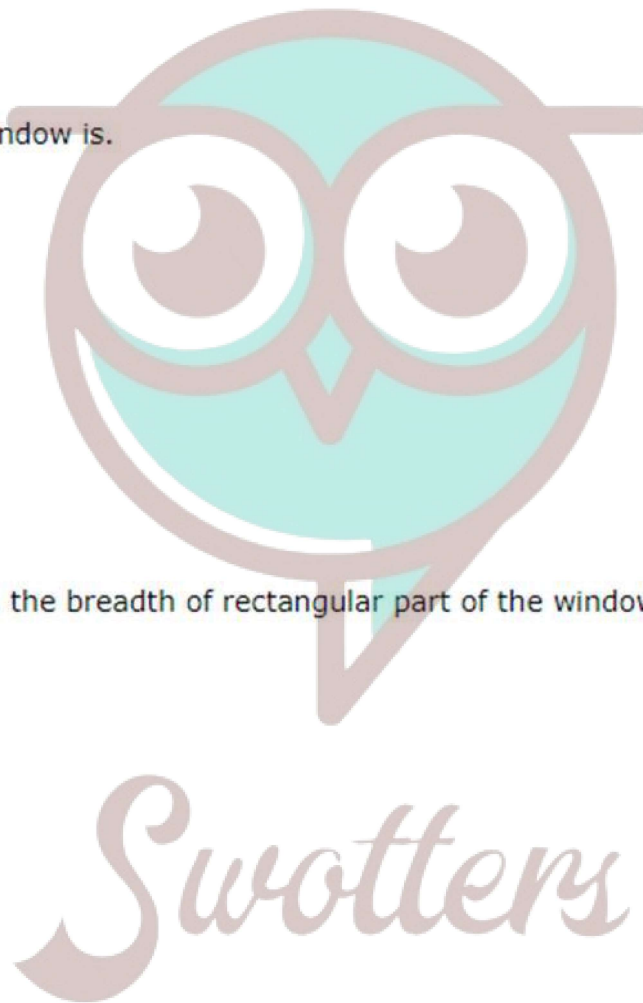
- a.  $\frac{10}{2-\pi}$
- b.  $\frac{20}{4-\pi}$
- c.  $\frac{20}{4+\pi}$
- d.  $\frac{10}{2+\pi}$

iv. Maximum area of the window is.

- a.  $\frac{30}{4+\pi}$
- b.  $\frac{30}{4-\pi}$
- c.  $\frac{50}{4-\pi}$
- d.  $\frac{50}{4+\pi}$

v. For maximum value of  $A$ , the breadth of rectangular part of the window is.

- a.  $\frac{10}{4+\pi}$
- b.  $\frac{10}{4-\pi}$
- c.  $\frac{20}{4+\pi}$
- d.  $\frac{20}{4-\pi}$



**Answer Key-**

**Multiple Choice questions-**

1. Answer: (b)  $12\pi$
2. Answer: (d) 126.
3. Answer: (d) (0, 2).

- 4. Answer: (d)  $-\frac{1}{3}$
- 5. Answer: (a) (1, 2)
- 6. Answer: (d) 77.66.
- 7. Answer: (c)  $0.09 x^3 m^3$
- 8. Answer: (a)  $(2\sqrt{2}, 4)$
- 9. Answer: (d)  $\frac{1}{3}$
- 10. Answer: (c) 1

**Very Short Answer:**

1. Solution:

The given curve is  $y = 5x - 2x^3$

$$\therefore \frac{dy}{dx} = 5 - 6x^2$$

i.e.,  $m = 5 - 6x^2$ ,

where 'm' is the slope.

$$\therefore \frac{dm}{dt} = -12x \frac{dx}{dt} = -12x (2) = -24x$$

$$\therefore \left. \frac{dm}{dt} \right]_{x=3} = -24(3) = -72.$$

Hence, the rate of the change of the slope = -72.

2. Solution:

Let  $x_1$  and  $x_2 \in R$ .

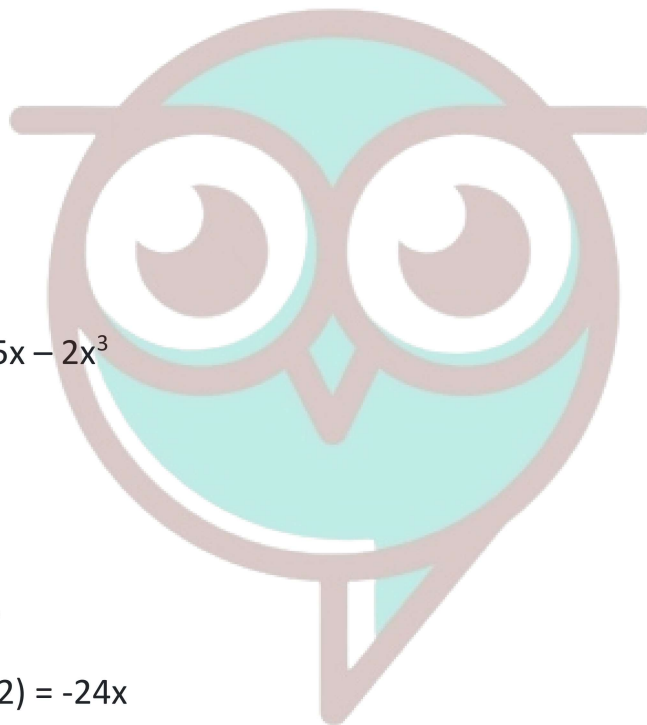
Now  $x_1 > x_2$

$$\Rightarrow 7x_1 > 7x_2$$

$$\Rightarrow 7x_1 - 3 > 7x_2 - 3$$

$$\Rightarrow f(x_1) > f(x_2).$$

Hence, 'f' is strictly increasing function in R.



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3. Solution:

We have:  $f(x) = 4x^3 - 18 \times 2 - 27x - 7$

$\therefore f(x) = 12x^2 - 36x + 27 = 12(x^2 - 3x) + 27$

$= 12(x^2 - 3x + 9/4) + 27 - 27$

$= 12(x - 3/2)^2 \forall x \in \mathbb{R}.$

Hence,  $f(x)$  is always increasing in  $\mathbb{R}$ .

4. Solution:

The given curve is  $x = at^2, y = 2at$ .

$\therefore \frac{dx}{dt} = 2at$

$\frac{dx}{dt} = 2a$

$\therefore \frac{dy}{dx} = \frac{dy/dt}{dx/dt} = \frac{2a}{2at} =$

Hence, slope of the tangent at  $t = 2$  is:  $\left. \frac{dy}{dx} \right|_{t=2} = \frac{1}{2}$

5. Solution:

(i) We have:

$f(x) = (2x - 1)^2 + 3.$

Here  $Df = \mathbb{R}$ .

Now  $f(x) \geq 3.$

$[\because (2x - 1)^2 \geq 0 \text{ for all } x \in \mathbb{R}]$

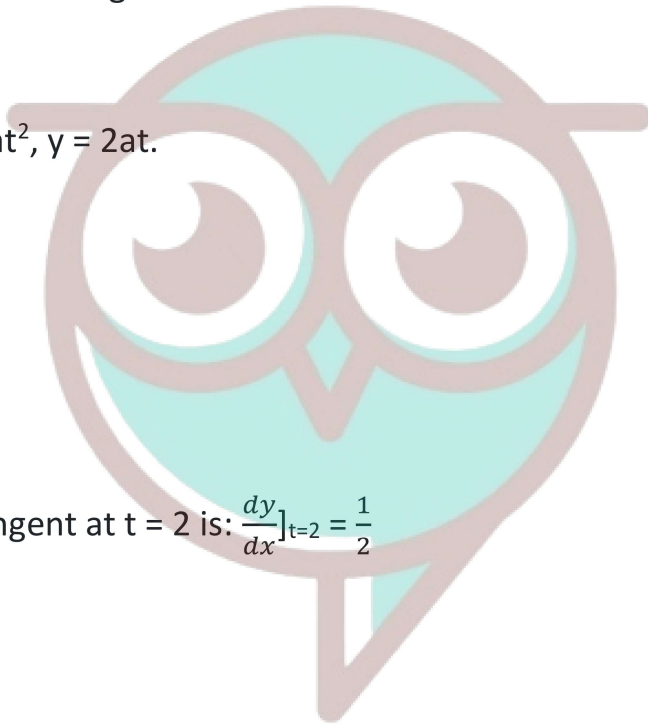
However, maximum value does not exist.

$[\because f(x)$  can be made as large as we please]

(ii) We have:

$f(x) = 16x^2 - 16x + 28.$

Here  $Df = \mathbb{R}$ .



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$$\text{Now } f(x) = 16(x^2 - x + 14) + 24$$

$$= (16(x - \frac{1}{2}))^2 + 24$$

$$\Rightarrow f(x) \geq 24.$$

$$[\because 16(x - 12)^2 \geq 0 \text{ for all } x \in \mathbb{R}]$$

Hence, the minimum value is 24.

However, maximum value does not exist.

[ $\because f(x)$  can be made as large as we please]

(iii) We have :

$$f(x) = -1x + 11 + 3$$

$$\Rightarrow f(x) \leq 3.$$

$$[\because -|x + 1| \leq 0]$$

Hence, the maximum value = 3.

However, the minimum value does not exist.

[ $\because f(x)$  can be made as small as we please]

(iv) We have :

$$f(x) = \sin 2x + 5.$$

Since  $-1 \leq \sin 2x \leq 1$  for all  $x \in \mathbb{R}$ ,

$$-1 + 5 \leq \sin 2x + 5 \leq 1 + 5 \text{ for all } x \in \mathbb{R}$$

$$\Rightarrow 4 \leq \sin 2x + 5 \leq 6 \text{ for all } x \in \mathbb{R}$$

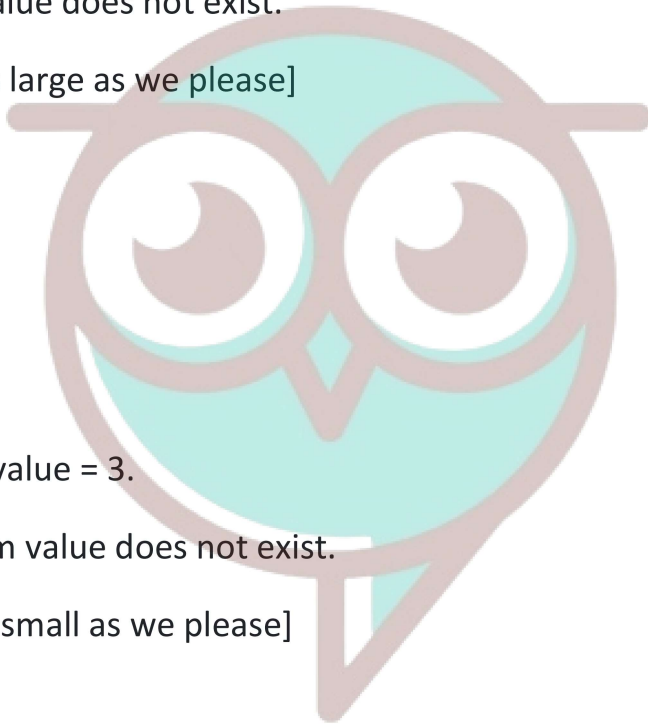
$$\Rightarrow 4 \leq f(x) \leq 6 \text{ for all } x \in \mathbb{R}.$$

Hence, the maximum value = 6 and minimum value = 4.

(v) We have :

$$f(x) = \sin(\sin x).$$

We know that  $-1 \leq \sin x \leq 1$  for all  $x \in \mathbb{R}$



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$$\Rightarrow \sin(-1) \leq \sin(\sin x) \leq \sin 1 \text{ for all } x \in \mathbb{R}$$

$$\Rightarrow -\sin 1 \leq f(x) \leq \sin 1.$$

Hence, maximum value =  $\sin 1$  and minimum value =  $-\sin 1$ .

6. Solution:

The given curve is  $x^2 = 2y \dots(1)$

$$\text{Diff.w.r.t.t, } 2x \frac{dx}{dt} = 2 \frac{dy}{dt}$$

$$\Rightarrow 2x \frac{dx}{dt} = 2 \frac{dy}{dt}$$

$$\therefore \frac{dy}{dt} = \frac{dx}{dt} \text{ given}$$

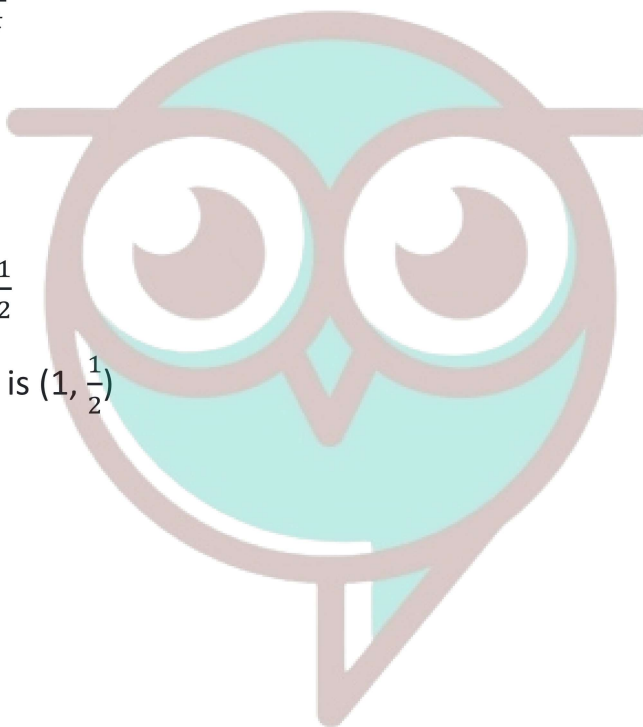
$$\text{From (1), } 1 = 2y \Rightarrow y = \frac{1}{2}$$

Hence, the reqd. point is  $(1, \frac{1}{2})$

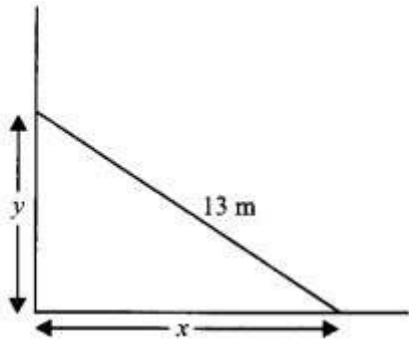
### Long Answer:

1. Solution:

$$\text{Here, } \frac{dx}{dt} = 2 \text{ cm/sec.}$$



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Now,  $169 = x^2 + y^2$

$\Rightarrow y = \sqrt{169 - x^2}$

$\therefore \frac{dy}{dx} = \frac{1}{2\sqrt{169 - x^2}} (-2x) \frac{dx}{dt}$   
 $= -\frac{x}{\sqrt{169 - x^2}} \quad (2)$

Hence,  $\left. \frac{dy}{dt} \right|_{x=5} = \frac{-5}{\sqrt{169 - 25}} \quad (2)$   
 $= \frac{-10}{12} = \frac{-5}{6} \text{ cm/sec.}$

Hence, the height is decreasing at the rate of  $5/6$  cm/sec.

2. Solution:

The given curves are:

$x^2 + y^2 = 4 \dots\dots\dots(1)$

$(x - 2)^2 + y^2 = 4 \dots\dots\dots (2)$

From (2),

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

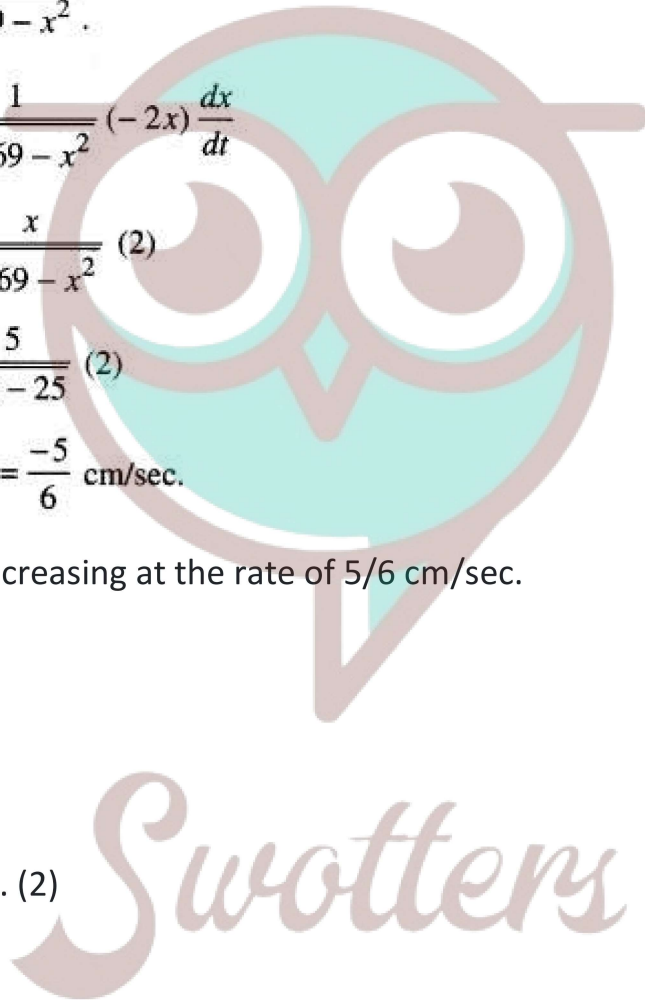
Putting in (1),

$x^2 + 4 - (x - 2)^2 = 4$

$\Rightarrow x^2 - (x - 2)^2 = 0$

$\Rightarrow (x + (x - 2))(x - x) + 2 = 0$

$\Rightarrow (2x - 2)(2) = 0$



$$\Rightarrow x = 1.$$

Putting in (1),

$$1 + y^2 = 4$$

$$\Rightarrow y = \sqrt{3}$$

$\therefore$  Point of intersection = (1,  $\sqrt{3}$ )

Diff. (1) w.r.t. x,  $2x + 2y \frac{dy}{dx} = 0$

$$\therefore \left. \frac{dy}{dx} \right|_{(1, \sqrt{3})} = -\frac{1}{\sqrt{3}} = m_1$$

Diff. (2) w.r.t. x,  $2(x-2) + 2y \frac{dy}{dx} = 0$

$$\Rightarrow \left. \frac{dy}{dx} \right|_{(1, \sqrt{3})} = \frac{1}{\sqrt{3}} = m_2$$

$$\text{So, } \tan \theta = \left| \frac{-\frac{1}{\sqrt{3}} - \frac{1}{\sqrt{3}}}{1 + \left(\frac{-1}{\sqrt{3}}\right)\left(\frac{1}{\sqrt{3}}\right)} \right| = \frac{\frac{1}{\sqrt{3}} + \frac{1}{\sqrt{3}}}{1 - \frac{1}{3}} = \sqrt{3}.$$

Hence,  $\theta = \frac{\pi}{3}.$

3. Solution:

Given function is:

$$f(x) = -2x^3 - 9x^2 - 12x + 1.$$

Diff. w.r.t. x,

$$f'(x) = -6x^2 - 18x - 12$$

$$= -6(x + 1)(x + 2).$$

Now,  $f'(x) = 0$

$$\Rightarrow x = -2, x = -1$$

$\Rightarrow$  Intervals are  $(-\infty - 2)$ ,  $(-2, -1)$  and  $(-1, \infty)$ .

Getting  $f'(x) > 0$  in  $(-2, -1)$

and  $f'(x) < 0$  in  $(-\infty, -2) \cup (-1, \infty)$

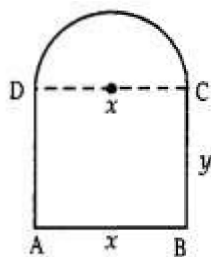
$\Rightarrow f(x)$  is strictly increasing in  $(-2, -1)$  and strictly decreasing in  $(-\infty, -2) \cup (-1, \infty)$ .

4. Solution:

Let 'x' and 'y' be the length and breadth of the rectangle ABCD.

Radius of the semi-circle =  $\frac{x}{2}$ .

Circumference of the semi-circle =  $\frac{\pi x}{2}$



By the question,  $x + 2y + \frac{\pi x}{2} = 10$

$$\Rightarrow 2x + 4y + \pi x = 20$$

$$\Rightarrow y = \frac{20 - (2 + \pi)x}{4} \quad \dots(1)$$

$$\therefore \text{Area of the figure} = xy + \frac{1}{2}\pi\left(\frac{x}{2}\right)^2$$

$$= x \frac{20 - (2 + \pi)x}{4} + \pi \frac{x^2}{8}$$

[Using (1)]

Thus  $A(x) = \frac{20x - (2 + \pi)x^2}{4} + \frac{\pi x^2}{8}$ .

$$\therefore A'(x) = \frac{20 - (2 + \pi)(2x)}{4} + \frac{2\pi x}{8}$$

and  $A''(x) = \frac{-(2 + \pi)2}{4} + \frac{2\pi}{8}$

$$= \frac{-4 - 2\pi + \pi}{4} = \frac{-4 - \pi}{4}$$



or Max ./Min. of A (x),  $A'(x) = 0$

$$\frac{20 - (2 + \pi)(2x)}{4} + \frac{2\pi x}{8} = 0$$

$$20 - (2 + \pi)(2x) + \pi x = 0$$

$$20 + x(\pi - 4 - 2\pi) = 0$$

$$20 - x(4 + \pi) = 0$$

$$x = \frac{20}{4 + \pi}$$

and breadth =  $y = \frac{20 - (2 + \pi) \frac{20}{4 + \pi}}{4}$

$$= \frac{80 + 20\pi - 40 - 20\pi}{4(4 + \pi)} = \frac{40}{4(4 + \pi)} = \frac{10}{4 + \pi}$$

And radius of semi-circle =  $\frac{10}{4 + \pi}$

### Case Study Answers:

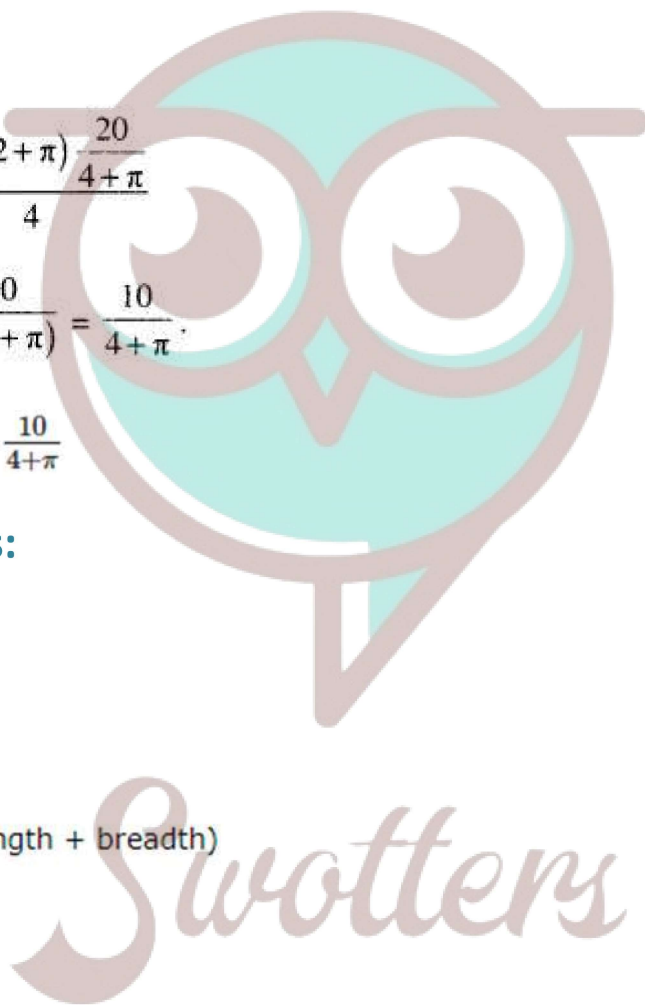
1. Answer :

i. (c)  $2(x + y) = P$

**Solution:**

Perimeter of floor =  $2(\text{Length} + \text{breadth})$

$\Rightarrow P = 2(x + y)$



ii. (c)  $A = \frac{px-2x^2}{2}$

**Solution:**

Area,  $A = \text{length} \times \text{breadth}$

$\Rightarrow A = xy$

Since,  $P = 2(x + y)$

$\Rightarrow \frac{P-2x}{2} = y$

$\therefore A = x\left(\frac{P-2x}{2}\right)$

$\Rightarrow A = \frac{Px-2x^2}{2}$

iii. (d)  $\frac{P}{4}$

**Solution:**

We have,  $A = \frac{1}{2}(Px - 2x^2)$

$\frac{dA}{dx} = \frac{1}{2}(P - 4x) = 0$

$\Rightarrow P - 4x = 0 \Rightarrow x = \frac{P}{4}$

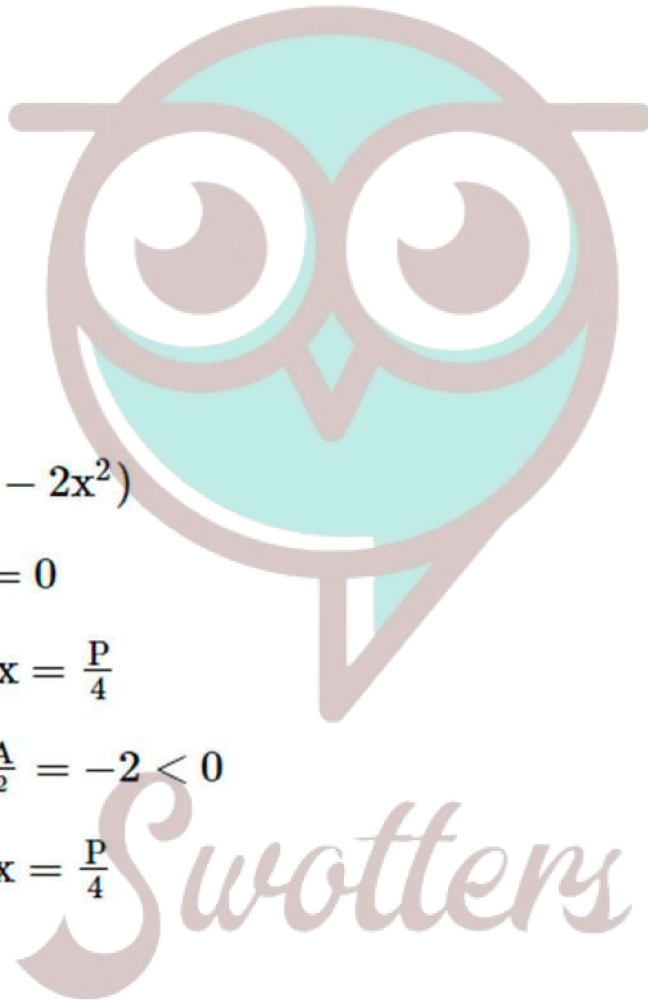
Clearly, at  $x = \frac{P}{4}$ ,  $\frac{d^2A}{dx^2} = -2 < 0$

$\therefore$  Area of maximum at  $x = \frac{P}{4}$

iv. (c)  $\frac{P}{4}$

**Solution:**

We have,  $y = \frac{P-2x}{2} = \frac{P}{2} - \frac{P}{4} = \frac{P}{4}$



v. (a)  $\frac{P^2}{16}$

**Solution:**

$$A = xy = \frac{P}{4} \cdot \frac{P}{4} = \frac{P^2}{16}$$

**2. Answer :**

i. (b)  $x + 2y + \frac{\pi x}{2} = 10$

**Solution:**

Given, perimeter of window = 10m

$\therefore x + y + y + \text{perimeter of semicircle} = 10$

$$\Rightarrow x + 2y + \pi \frac{x}{2} = 10$$

ii. (b)  $A = 5x - \frac{x^2}{8} - \frac{\pi x^2}{8}$

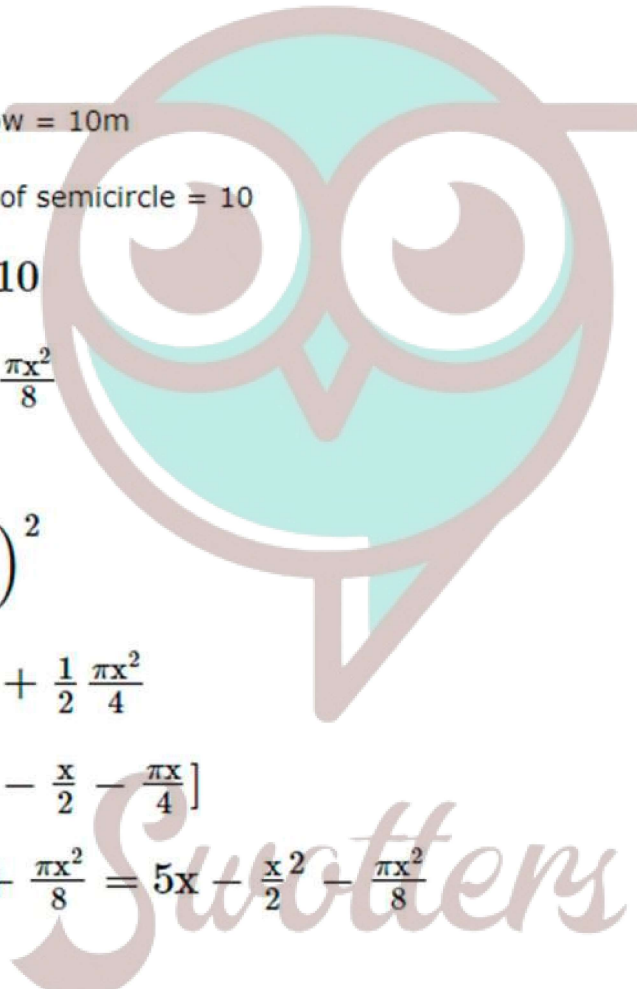
**Solution:**

$$A = x \cdot y + \frac{1}{2} \pi \left( \frac{x}{2} \right)^2$$

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

$$[\therefore \text{From (i), } y = 5 - \frac{x}{2} - \frac{\pi x}{4}]$$

$$= 5x - \frac{x^2}{2} - \frac{\pi x^2}{4} + \frac{\pi x^2}{8} = 5x - \frac{x^2}{2} - \frac{\pi x^2}{8}$$



iii. (c)  $\frac{20}{4+\pi}$

**Solution:**

We have,  $A = 5x - \frac{x^2}{2} - \frac{\pi x^2}{8}$

$\Rightarrow \frac{dA}{dx} = 5 - x - \frac{\pi x}{4}$

Now,  $\Rightarrow \frac{dA}{dx} = 0$

$\Rightarrow 5 = x + \frac{\pi x}{4}$

$\Rightarrow x(4 + \pi) = 20$

$\Rightarrow x = \frac{20}{4+\pi}$

$\left[ \text{Clearly, } \frac{d^2A}{dx^2} < 0 \text{ at } x = \frac{20}{4+\pi} \right]$

iv. (d)  $\frac{50}{4+\pi}$

**Solution:**

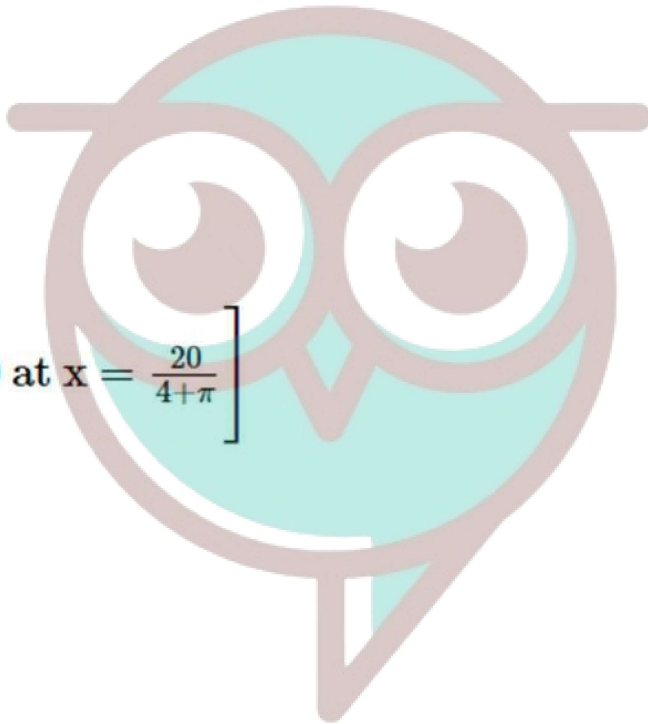
At  $x = \frac{20}{x} = \frac{20}{4+\pi}$

$A = 5\left(\frac{20}{4+\pi}\right) - \left(\frac{20}{4+\pi}\right)^2 \frac{1}{2} - \frac{\pi}{8} \left(\frac{20}{4+\pi}\right)^2$

$= \frac{100}{4+\pi} - \frac{200}{(4+\pi)^2} - \frac{50\pi}{(4+\pi)^2}$

$\frac{(4+\pi)(100) - 200 - 50\pi}{(4+\pi)^2} = \frac{400 + 100\pi - 200 - 50\pi}{(4+\pi)^2}$

$\frac{200 + 50\pi}{(4+\pi)} = \frac{50(4+\pi)}{(4+\pi)} = \frac{50}{4+\pi}$



v. (a)  $\frac{10}{4+\pi}$

**Solution:**

$$\begin{aligned} \text{We have, } y &= 5 - \frac{x}{2} - \frac{\pi x}{4} = 5 - x\left(\frac{1}{2} + \frac{\pi}{4}\right) \\ &= 5 - x\left(\frac{2+\pi}{4}\right) = 5 - \left(\frac{20}{4+\pi}\right)\left(\frac{2+\pi}{4}\right) \\ &= 5 - 5\frac{(2+\pi)}{4+\pi} = \frac{20+5\pi-10-5\pi}{4+\pi} = \frac{10}{4+\pi} \end{aligned}$$

**Assertion and Reason Answers:**

1. a) Both A and R are true and R is the correct explanation of A.

**Solution:**

Given that  $f(x)=2+\cos x$

Clearly  $f(x)$  is continuous and differentiable everywhere Also  $f'(x) = -\sin x \Rightarrow f'(x=0)$

$\Rightarrow -\sin x = 0 \Rightarrow x = n\pi$

$\therefore$  These exists  $C \in [t, t+\pi]$  for  $t \in R$

such that  $f'(C) = 0$

$\therefore$  Statement-1 is true Also

$f(x)$  being periodic function of period  $2\pi$

$\therefore$  Statement-2 is true, but Statement-2 is not a correct explanation of Statement -1.

2. (a) Both A and R are true and R is the correct explanation of A.

**Solution:**

Given  $f(x)=x^3-2x^2-1=0$

Here,  $f(2)=(2)^3-2(2)^2-1=8-8-1=-1$

and  $f(3)=(3)^3-2(3)^2-1=27-18-1=8$

$\therefore f(2)f(3)=(-1)8=-8<0$

$\Rightarrow$  One root of  $f(x)$  lies between 2 and 3

$\therefore$  Given Assertion is true Also Reason R is true and valid reason

$\therefore$  Both A and R are correct and R is correct explanation of A.