YAKEEN NEET 2.0

2026

KPP-05

Basic Maths and Calculus (Mathematical Tools)

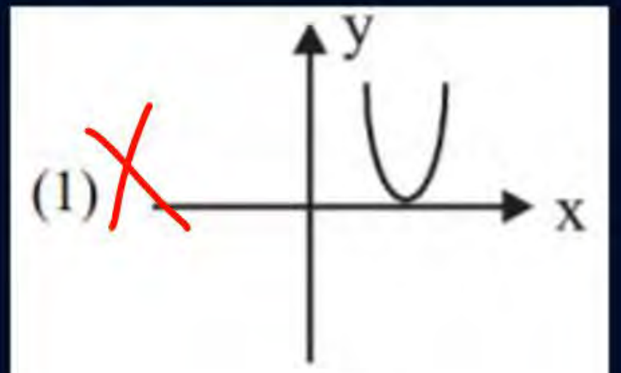
PHYSICS

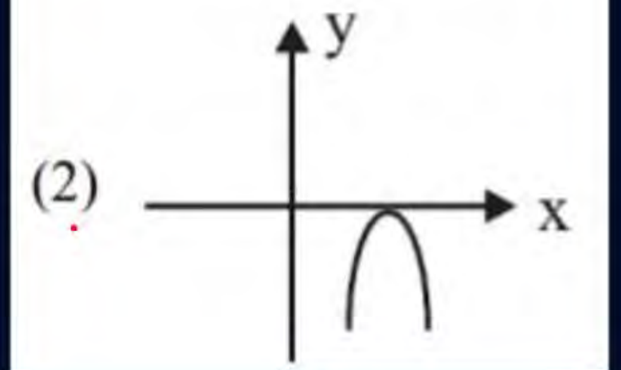
Lecture 05

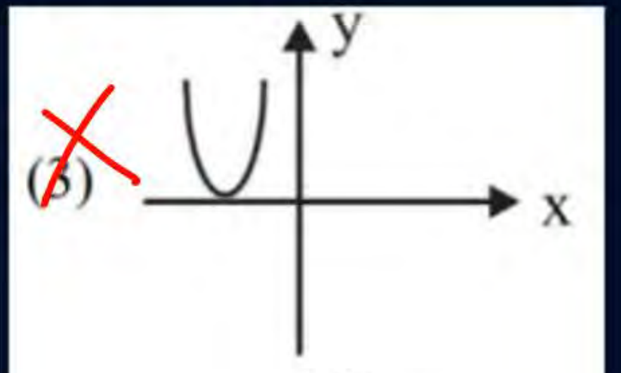
By - Saleem Ahmed Sir

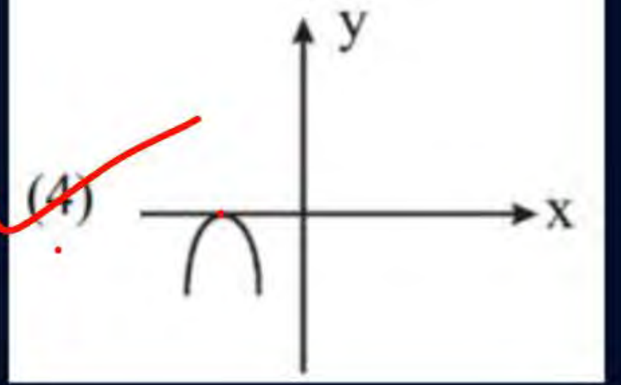
Question - 01

Correct graph of $y = -(x+2)^2$ is:

(1) 

(2) 

(3) 

(4) 

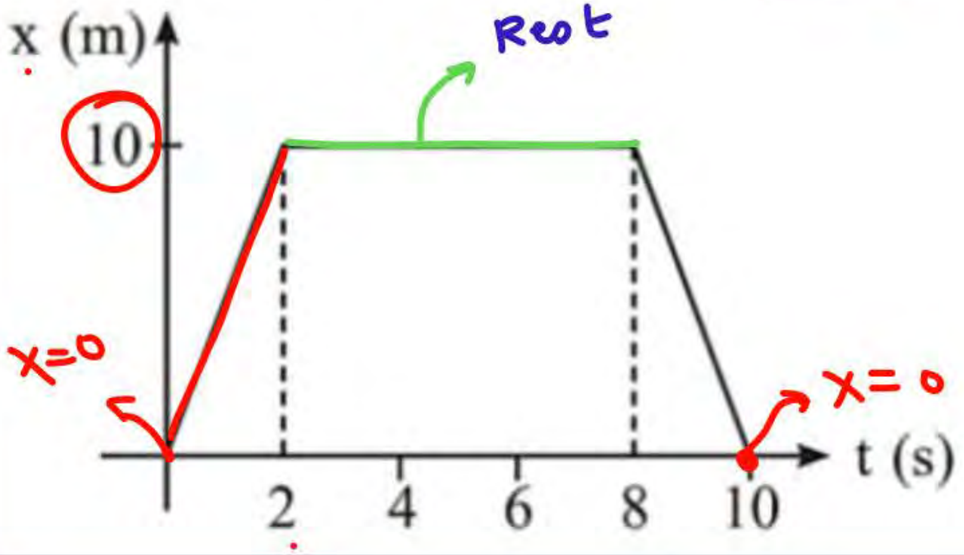
$y = -x^2 - 4x - 4$

$y = 0, \quad x = -2$

Ans : (4)

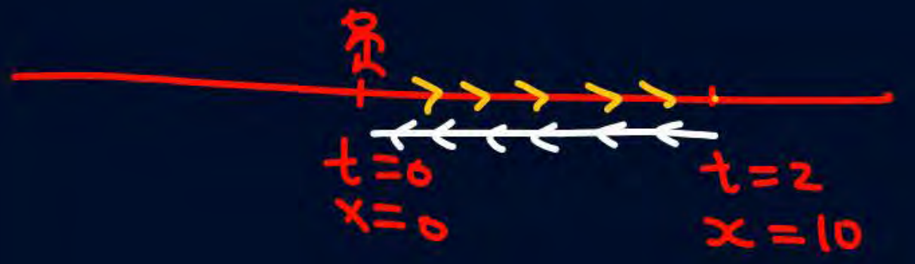
Question - 02

The position-time graph for a particle moving along a straight line is shown in figure. The total distance travelled by it in time $t = 0$ to $t = 10$ s is:



(1) Zero
(2) 10 m
(3) 20 m
(4) 80 m

$\langle \text{speed} \rangle = \frac{20}{10} = 2$

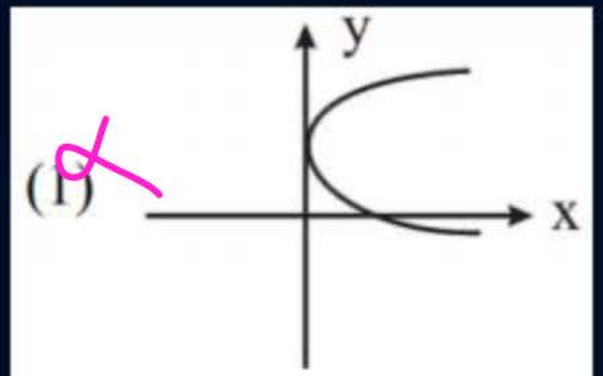


Ans : (3)

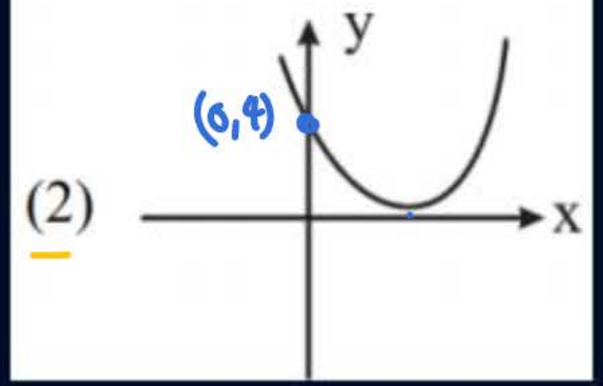
Question - 03

Graph of $y = 2(x+1)^2 + 2$ is:

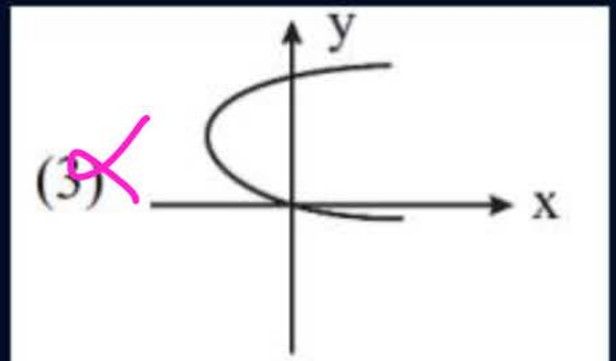
(1)



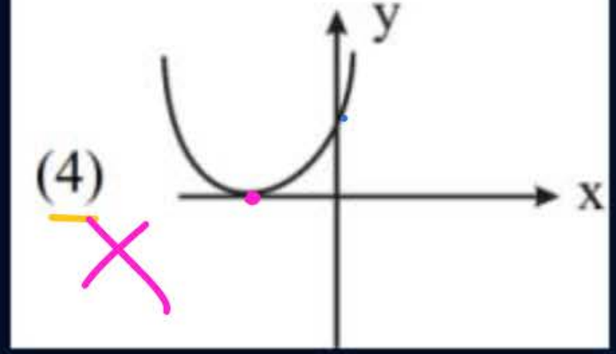
(2)



(3)



(4)

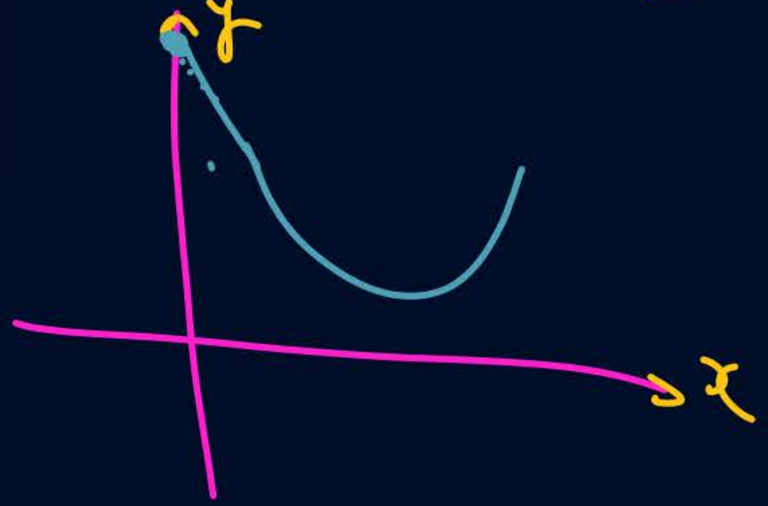


$y = 2x^2 + 2 + 4x + 2$

$y = 2x^2 + 4x + 4$

$b^2 - 4ac = 16 - 4 \times 2 \times 4$

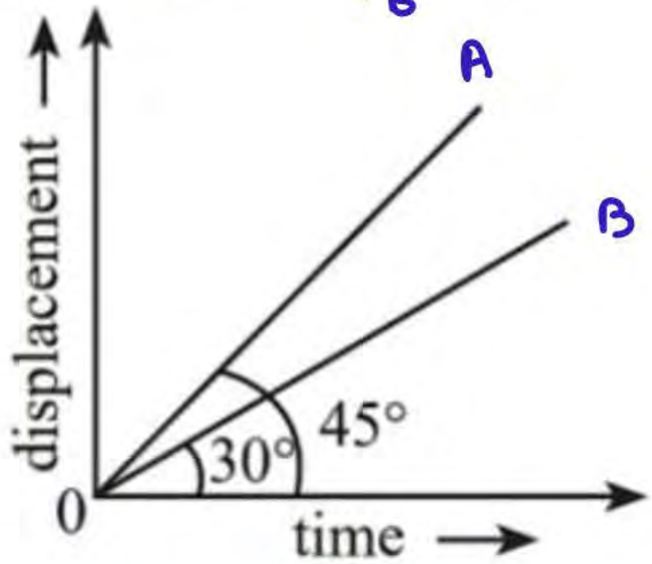
$16 - 32 = -16$



Ans : (2)

Question - 04

The displacement time graphs of two moving particle make angles of 30° and 45° with the x-axis as shown in the figure. The ratio of their respective velocity is: $\frac{v_A}{v_B} = ?$ **(NEET-2022)**



(1) $1:\sqrt{3}$

(2) $\sqrt{3}:1$

(3) $1:1$

(4) $1:2$

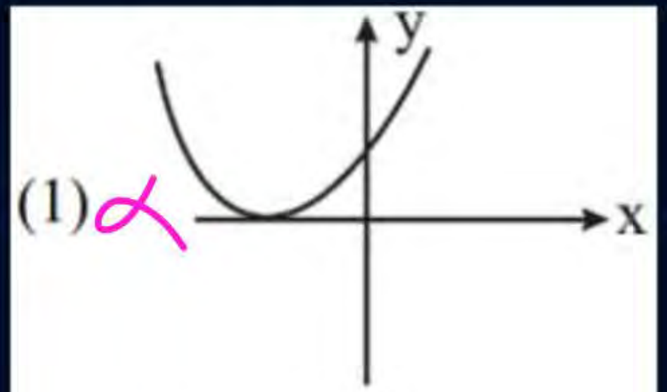
$$\frac{v_A}{v_B} = \frac{\tan 45^\circ}{\tan 30^\circ} = \frac{1}{1/\sqrt{3}} = \sqrt{3}:1$$

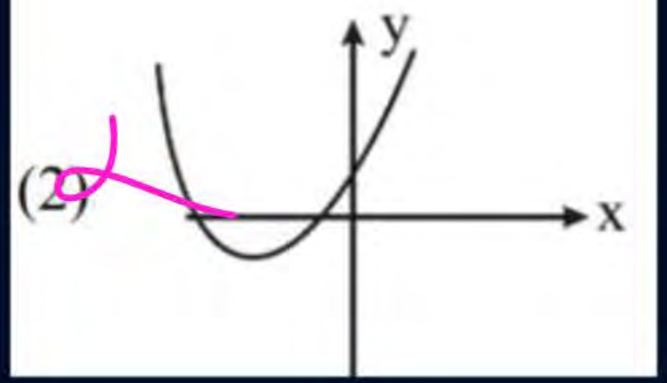
$$\frac{v_B}{v_A} = \frac{1}{\sqrt{3}}$$

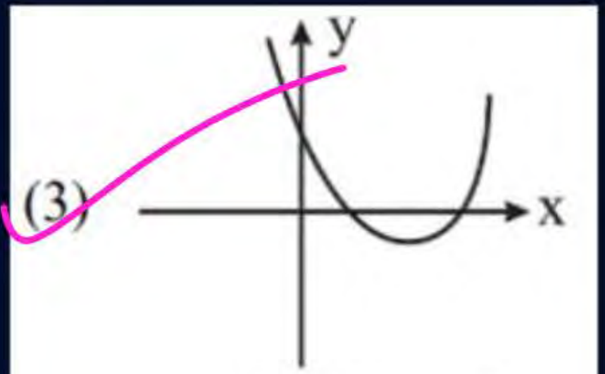
Ans : (2)

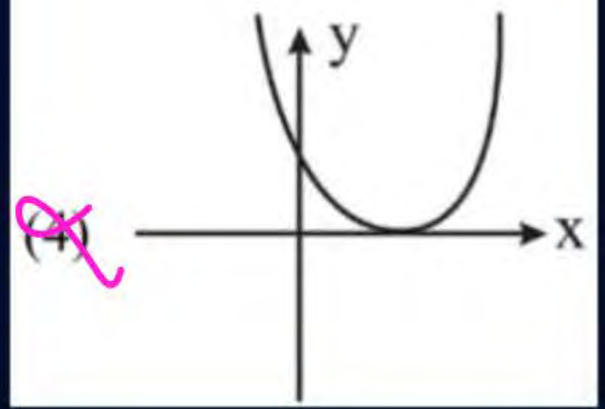
Question - 05

Graph of $y = 3x^2 - 4x + 1$ is:

(1) 

(2) 

(3) 

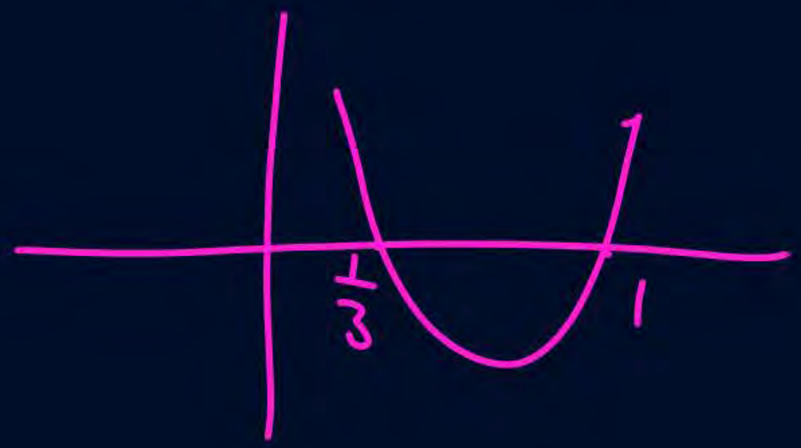
(4) 

$y = 3x^2 - 3x - x + 1$

$y = 3x(x-1) - 1(x-1)$

$y = (x-1)(3x-1)$

$x = 1, \; x = \frac{1}{3}$



Ans : (3)

Question - 06

In quadratic equation $ax^2 + bx + c = 0$, if discriminant is $D = b^2 - 4ac$, then roots of the quadratic equation are : (choose the correct alternative)

(1) Real and distinct, if $D > 0$

(2) Real and equal (ie., repeated roots), if $D = 0$.

(3) Non-real (i.e. imaginary), if $D < 0$

(4) All of the above are correct

$D = b^2 - 4ac$ >0 ②

$=0$ ①

<0 ×

Ans : (4)

Question - 07

The equation of a curve is given as $y = x^2 + 2 - 3x$. The curve intersects the x-axis at

(1) (1, 0)

(2) (2, 0)

(3) Both (1) and (2)

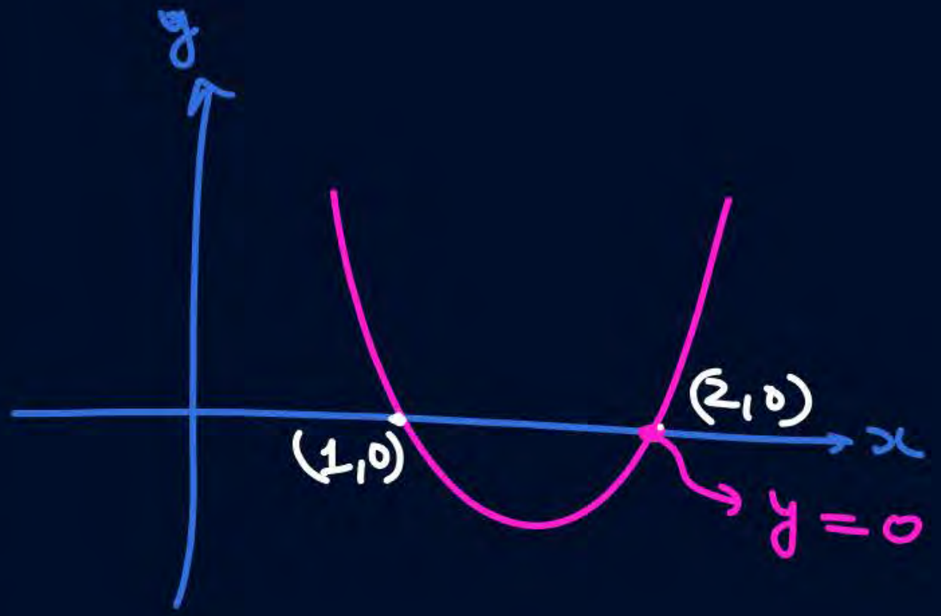
(4) No where

→ $y = 0$

$x^2 - 3x + 2 = 0$

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

$x = 1, 2$



Best Option

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

$x = 1$ $y = 0$

Ans : (3)

Question - 08

Two particles A and B are moving in XY-plane. Their positions vary with time t according to relation:

$x_A(t) = 3t, \quad x_B(t) = 6$

$y_A(t) = t, \quad y_B(t) = 2 + 3t^2$

Distance between two particles at $t = 1$ is:

(1) 5 (2) 3

(3) 4 (4) $\sqrt{12}$

(A) $t=1 \Rightarrow (3,1)$

(B) $t=1 \Rightarrow (6,5)$

$$\text{Dist}^{n} = \sqrt{(6-3)^2 + (5-1)^2}$$

$$= \sqrt{3^2+4^2} = 5$$

Ans : (1)

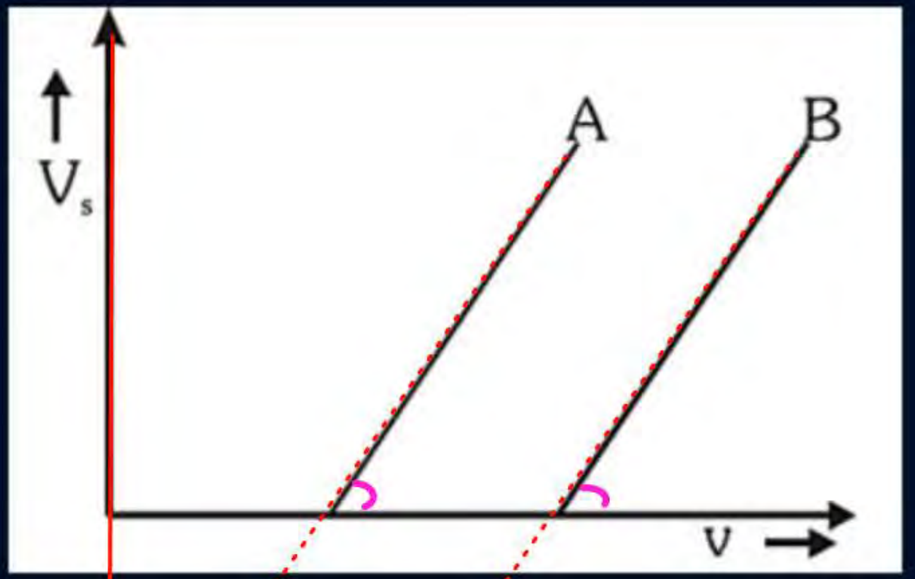
Question - 09

The stopping potential as a function of frequency of incident radiation is plotted for two different surfaces A and B. The graphs show that the work function of A is: (use $h\nu = \phi + ev_s$)

$\phi \rightarrow$ work fxn

(1) Greater than that of B
(2) Smaller than that of B
(3) Same as that of B
(4) No comparison can be done from given graphs

$\phi_B > \phi_A$



Slope $= \frac{h}{e}$

$hx = \phi + ey$

$y = \left(\frac{h}{e}\right)x - \frac{\phi}{e}$

$-\frac{\phi_A}{e}$ -10

$-\frac{\phi_B}{e}$ -20

Ans : (2)

Question - 10

Graph is plotted between maximum kinetic energy of electron with frequency of incident photon in Photo electric effect. The slope of curve will be:

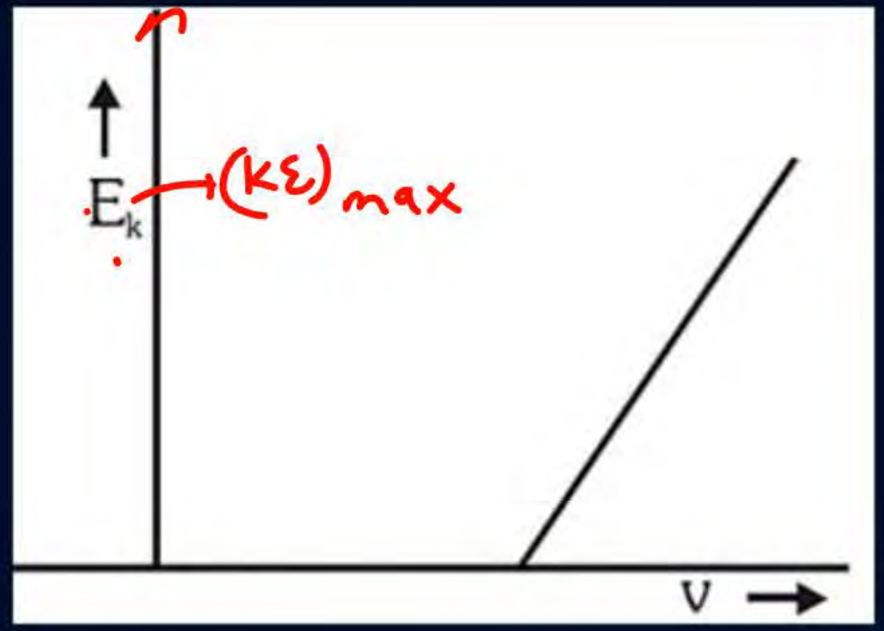
Use $h\nu = \phi + (KE)_{max}$

(1) Charge of electron

(2) Work function of metal

(3) Planck's constant $\equiv h$

(4) Ratio of Planck constant and charge of electron



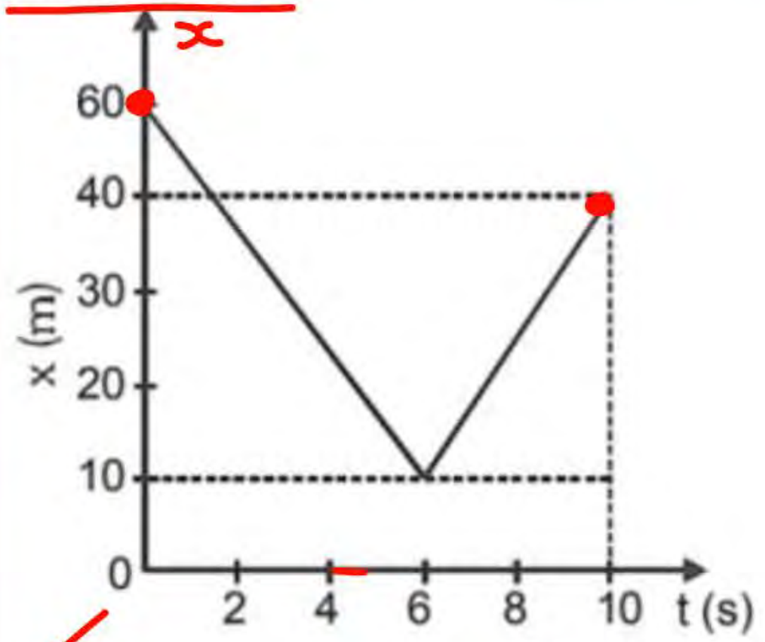
$$hx = \phi + y$$

$$y = hx - \phi$$

Ans : (3)

Question - 11

The fig. shows the position time graph of a particle moving on a straight line path. What is the magnitude of average velocity of the particle over 10 seconds?



(1) 2 m/s
(2) 4 m/s
(3) 6 m/s
(4) 8 m/s

$$\text{Avg velocity} = \frac{\text{displacement}}{\text{time}}$$

$$= \frac{x_f - x_i}{\text{time}}$$

$$= \frac{40 - 60}{10}$$

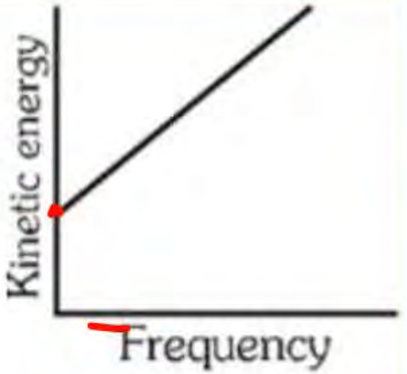
$$= -2$$

Ans : (1)

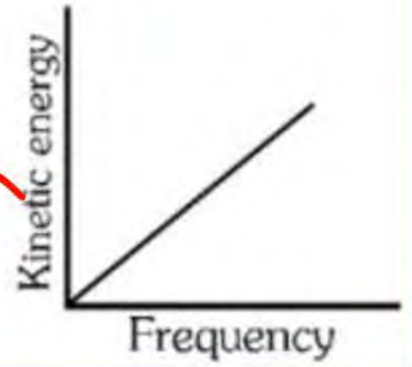
Question - 12

According to Einstein's photoelectric equation, the graph between the kinetic energy of photoelectrons ejected and the frequency of incident radiation is: Use $h\nu = \phi + (KE)_{max}$

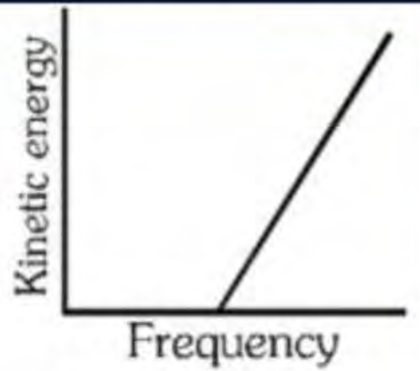
(1)



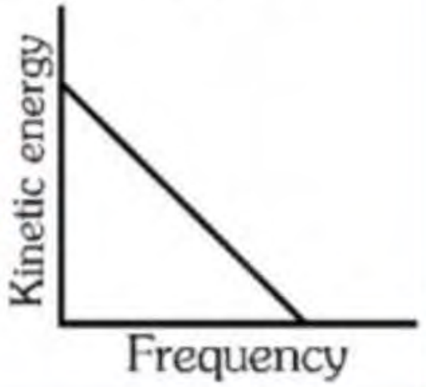
(2)



(3)

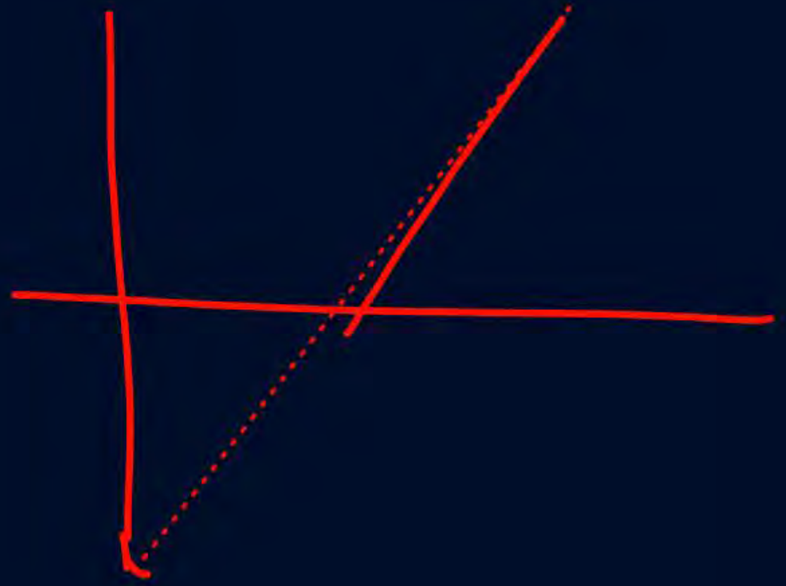


(4)



$(KE)_{max} = h\nu - \phi$

$y = hx - \phi$

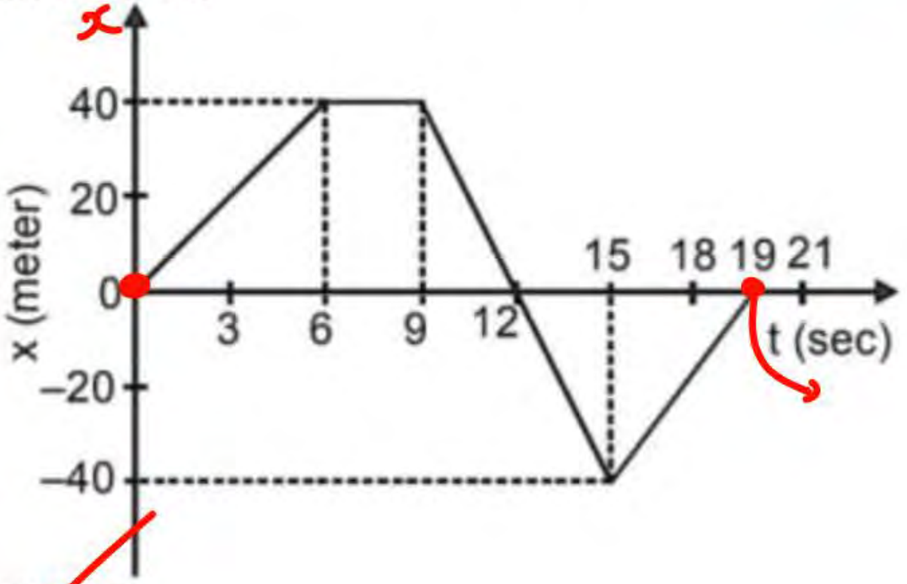


3

Ans : (3)

Question - 13

A person walks along an east-west street and a graph of his displacement from home is shown in figure. His average velocity for the whole time interval is:



(1) 0
(2) 23 m/s
(3) 8.4 m/s
(4) None of above

$$\text{Avg velocity} = \frac{x_f - x_i}{\text{time}}$$

Ans : (1)

Question - 14

The values of θ in interval $\left[0, \frac{\pi}{2}\right]$ for which

$10\cos^2\theta - 11\cos\theta + 3 = 0$:

(i) $30°$ (ii) $37°$

(iii) $53°$ (iv) $60°$

(1) (i) and (iii) (2) (i) and (ii)

(3) (iii) and (iv) (4) (ii) and (iii)

$\cos\theta = \frac{3}{5} \Rightarrow \theta = 53°$

$\cos\theta = \frac{1}{2} \Rightarrow \theta = 60°$

$\cos\theta = x$

$10\cos^2\theta - 11\cos\theta + 3 = 0$

$10x^2 - 11x + 3 = 0$

$10x^2 - 5x - 6x + 3 = 0$

$5x(2x-1) - 3(2x-1) = 0$

$(5x-3)(2x-1) = 0$

$x = \frac{3}{5}, \frac{1}{2}$

Ans : (3)

Question - 15

Find $\frac{dy}{dx}$, when

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

(ii) $y=x^5+x^4+7 \Rightarrow y' = 5x^4 + 4x^3$

(iii) $y=x^2+4x^{-1/2}-3x^{-2}$

① $\frac{dy}{dx} = \frac{1}{2} x^{\frac{1}{2}-1} = \frac{1}{2\sqrt{x}}$

Ans : (i) $\frac{1}{2\sqrt{x}}$; (ii) $5x^4+4x^3$; (iii) $2x-2x^{-3/2}+6x^{-3}$

Question - 16

Solve the equation $2x^2 + 5x - 12 = 0$

$2x^2 + 8x - 3x - 12 = 0$

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

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

$x = 3/2, -4$

$x_1 = \frac{-5 + \sqrt{25 + 4 \times 2 \times 12}}{2 \times 2}$

$= \frac{-5+11}{4} = \frac{3}{2}$

Ans : $x = \frac{3}{2}, -4$

Question - 17

Draw the graph of following curve.

(i) $y=\sqrt{x}$

(ii) $y=-\sqrt{x}$

(iii) $y=\sqrt{-x}$

(iv) $y=-\sqrt{-x}$

(v) $y=x^2$

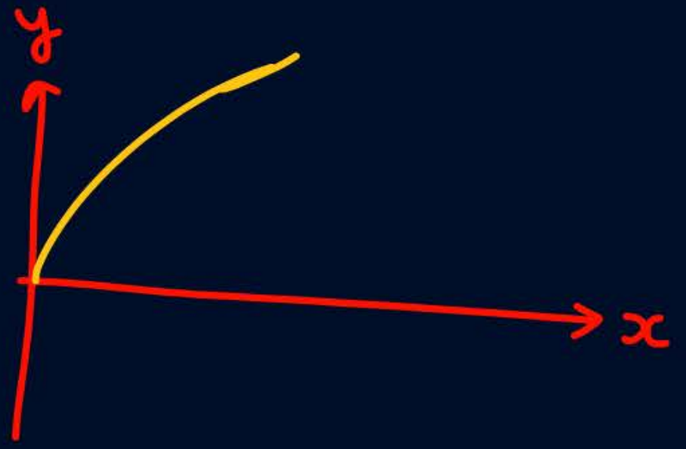
(vi) $y=-x^2$

(vii) $y^2=x$

(viii) $y^2=-x$

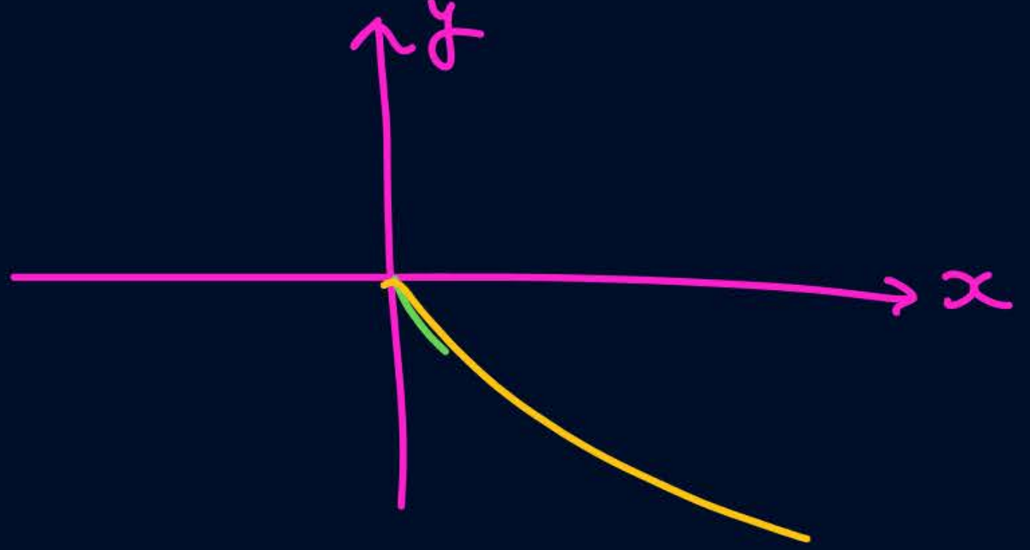
① $y=\sqrt{x}$

$x \to +$
$y \to +$

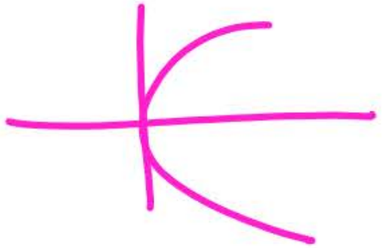


② $y=-\sqrt{x}$

$x \to +ve$
$y < 0$



⑦ $y^2=x$



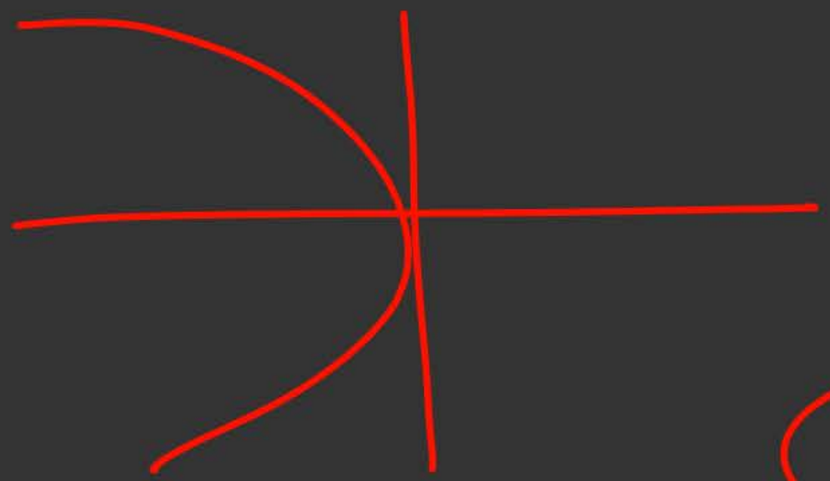
⑧

$y^2 = -x$

$-x$ → +ve

x → −ve होना

+ve होना है



$y^2 = -x$

$= -(-16)$

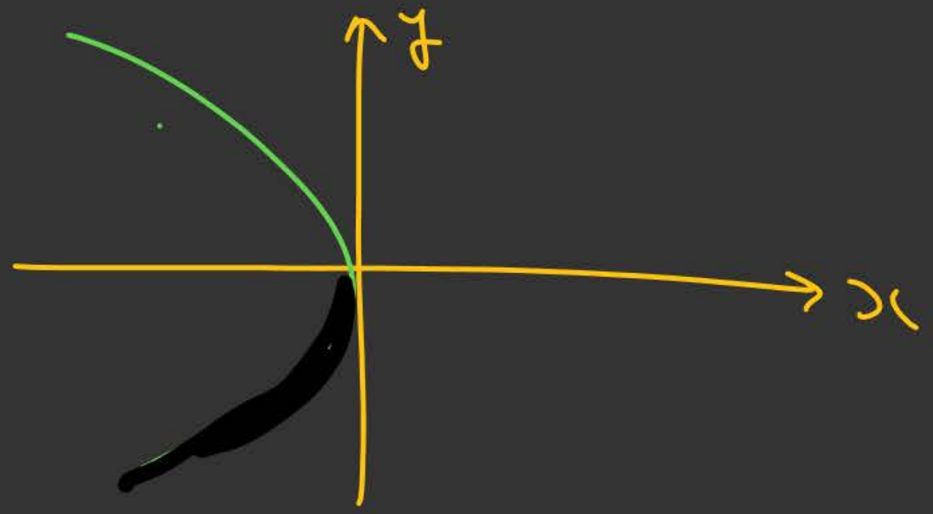
$y^2 = 16$

$y = \pm 4$

$x = -16$

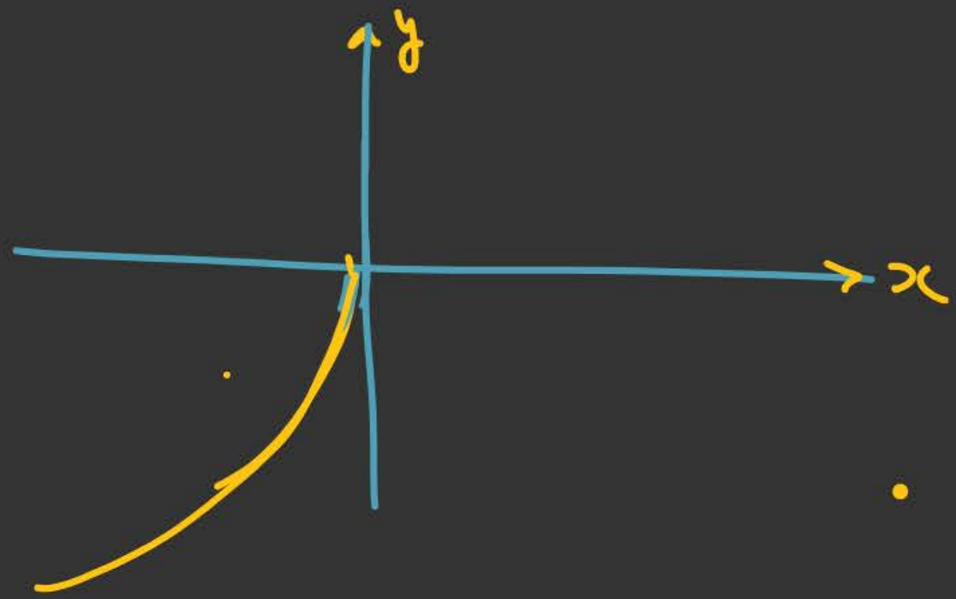
③ $y = \sqrt{-x}$

$x \longrightarrow$ -ve होना पड़ेगा।
$y \longrightarrow$ +ve

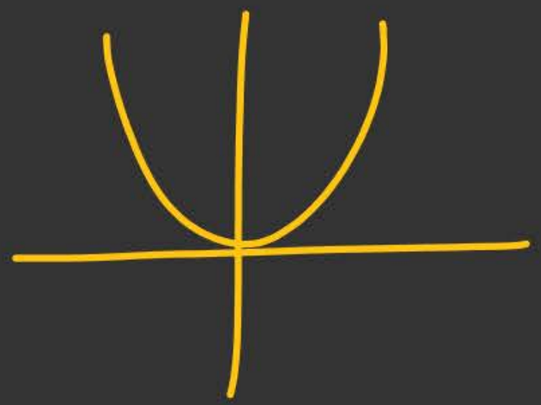


④ $y = -\sqrt{-x}$

$x \longrightarrow$ -ve रखना पड़ेगा।
$y \longrightarrow$ -ve आएगा।



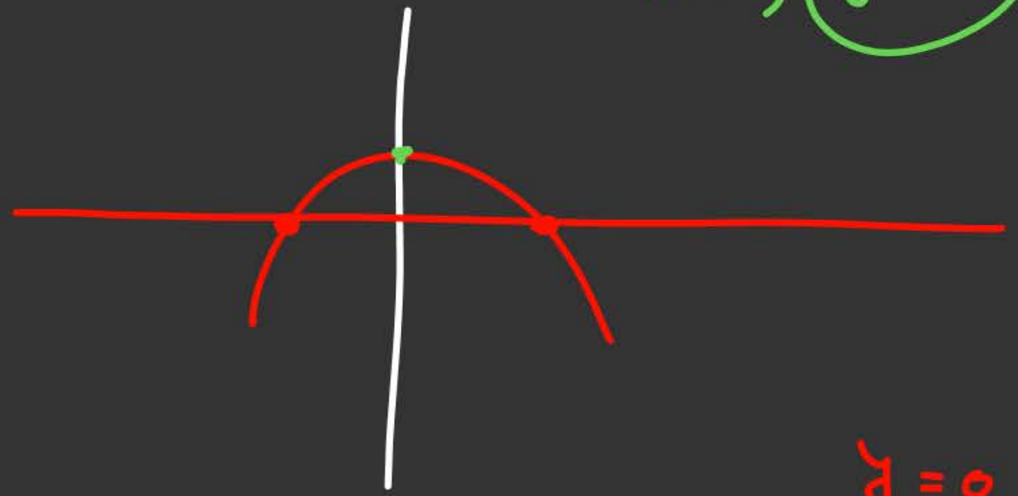
⑤ $y = x^2$



⑥ $y = -x^2$

let $y = -x^2 + 4$

$x = 0$, $y = 4$

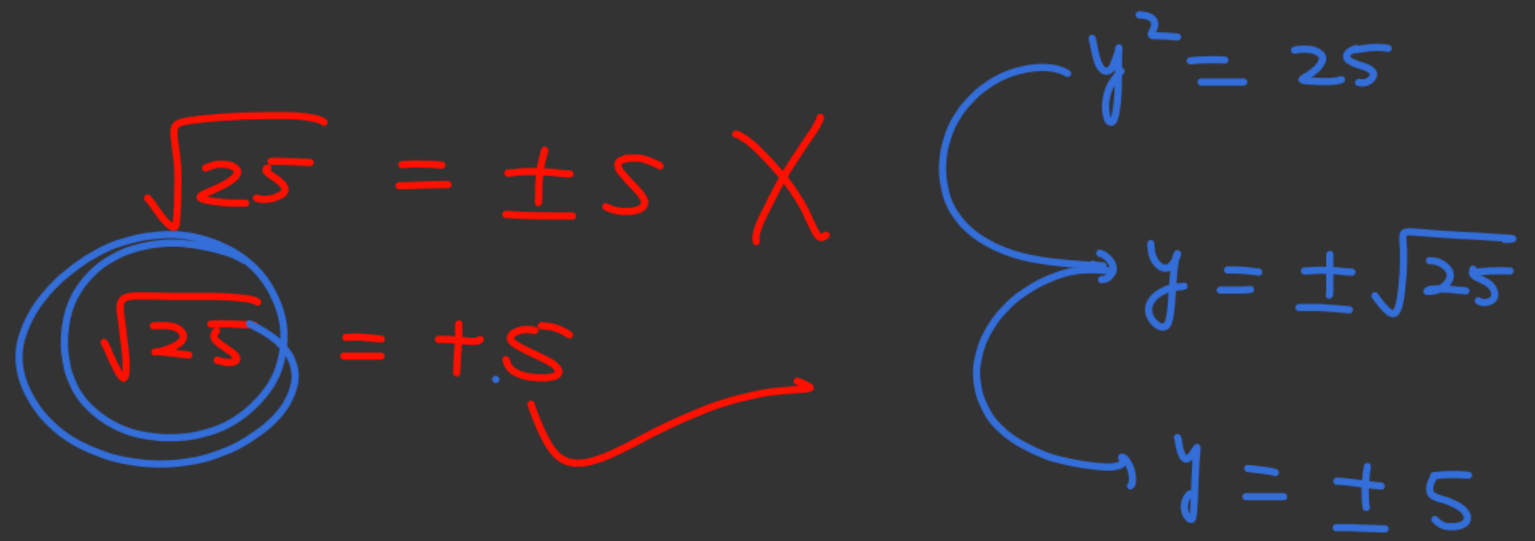


$y = 0$

नहीं

$x^2 = 4$

$x = \pm 2$

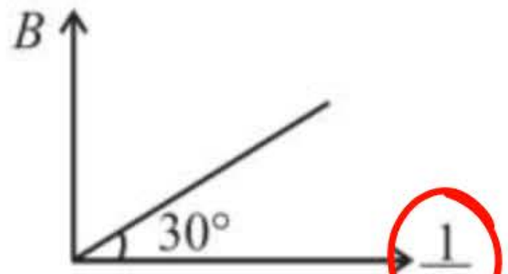

√25 = ±5 X
√25 = +5
y² = 25
y = ±√25
y = ±5

Question - 18

If magnetic field due to infinite wire at a distance r is given by:

$B = \frac{2ki}{r}$ where $k = 10^{-7}$ (In SI system)

If B Vs $\frac{1}{r}$ graph is given. Find Value of current in wire.



$$B = \frac{2ki}{r}$$

$$y = 2ki \cdot x$$

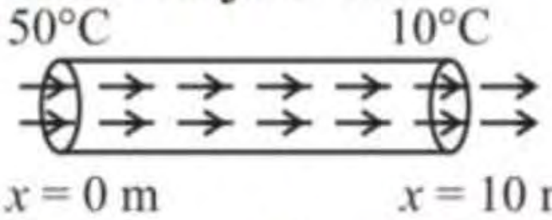
$$\text{Slope} = 2ki = \tan 30^\circ$$

$$2 \times 10^{-7} \times i = \frac{1}{\sqrt{3}}$$

$$i = \frac{10^7}{2\sqrt{3}}$$

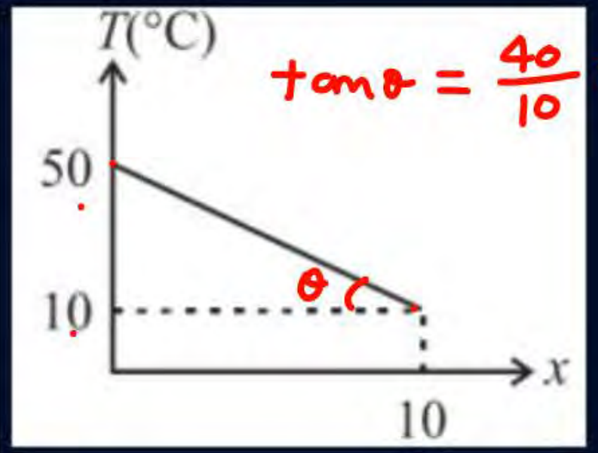
Question - 19

Suppose in following metal rod heat is flowing at constant rate of 10 jule/sec.



If area of cross section is 2 m^2. Find value of thermal conductivity if temperature of ends are fixed at 50°C and 10°C and graph is given

Use ($\frac{dQ}{dt} = -KA\frac{dT}{dx}$ = rate of heat flow). Where K is thermal conductivity and A is area of cross-section



$\tan\theta = \frac{40}{10} = 4$

$\frac{dT}{dx}$ → slope

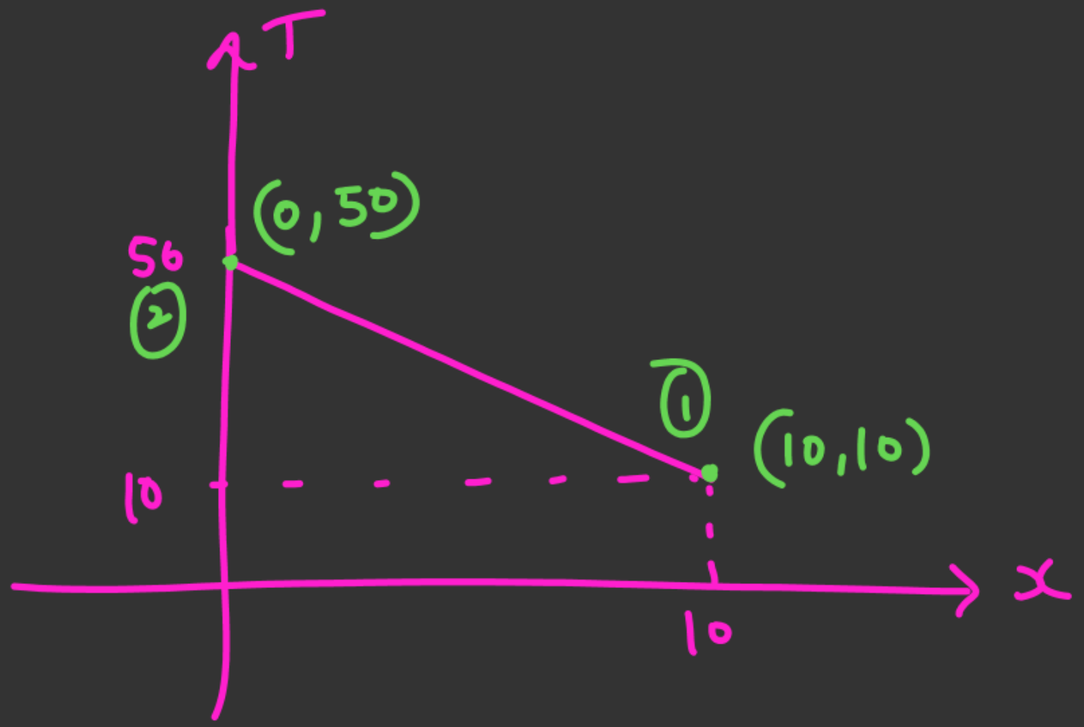
$\frac{dy}{dx}$ →

$\frac{dQ}{dt} = 10$

$\frac{dQ}{dt} = -KA\left(\frac{dT}{dx}\right)$

$10 = -K \times 2 \times (-4)$

$K = \frac{10}{8}$



$$\text{Slope} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{50 - 10}{0 - 10} = -4$$

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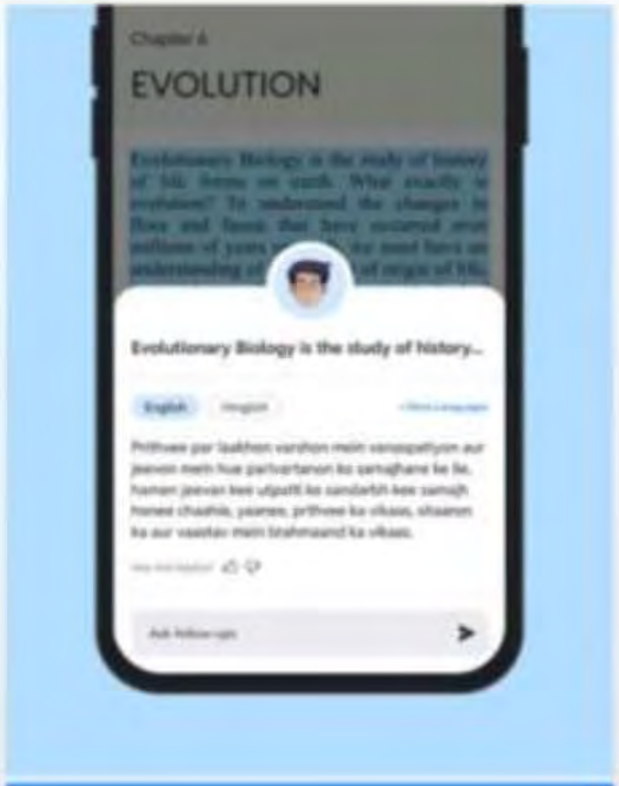

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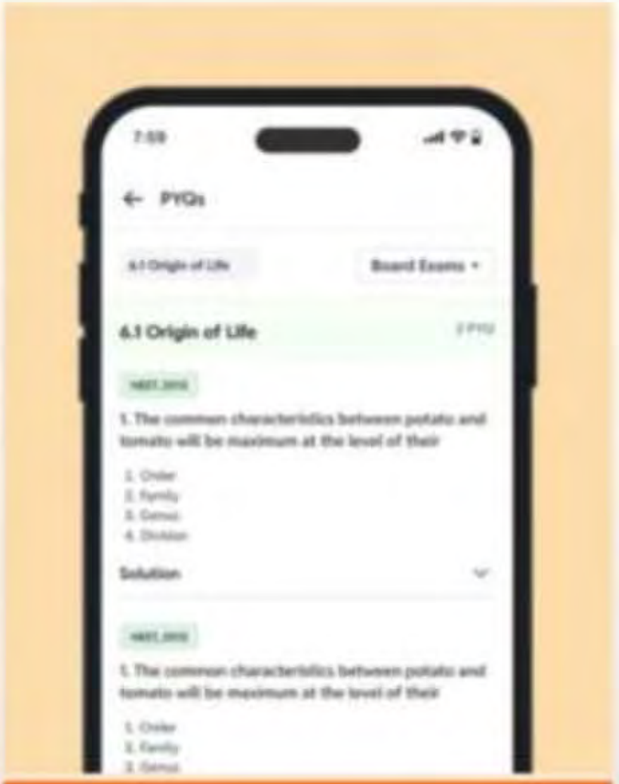

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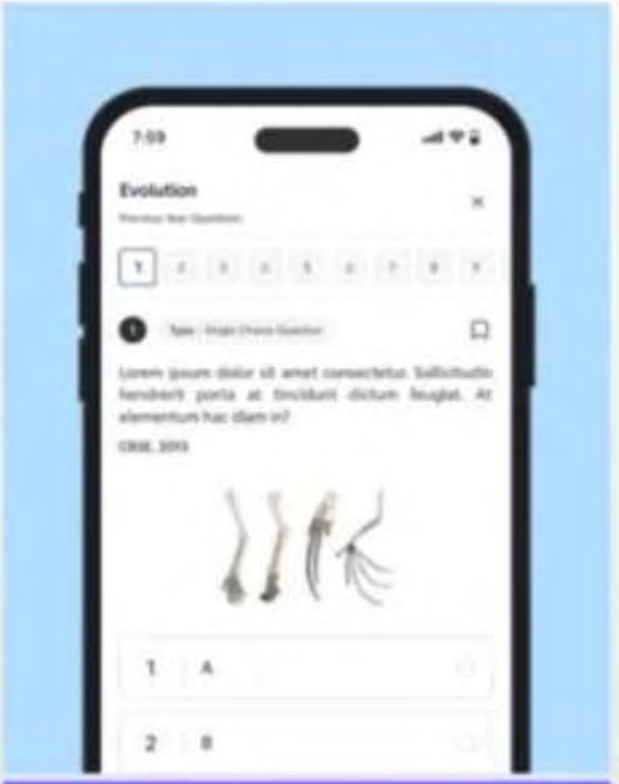

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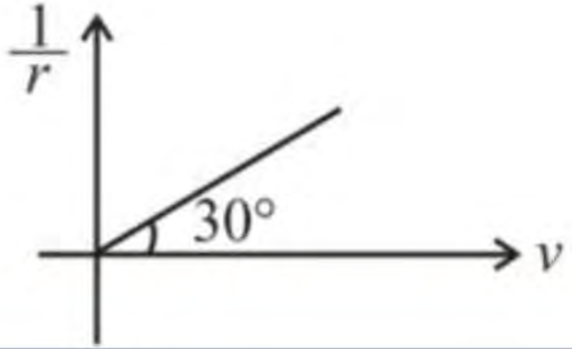
Question - 20

Graph between electric potential vs $\frac{1}{r}$ due to a point chare is plotted as shown in daigram. Find value of charge if potential due to point charge 'q' at distance 'r' is given by:

$v = \frac{kq}{r}$ $\left(\text{where } k = 9\times10^9\right)$



$\frac{1}{9\times10^9 \times q} = \frac{1}{\sqrt{3}}$

$q = \frac{\sqrt{3}}{9\times10^9}$

$x = kqy$

$y = \frac{x}{kq} = \left(\frac{1}{kq}\right)x$

$\text{Slope} = \frac{1}{kq} = \tan 30 = \frac{1}{\sqrt{3}}$

THANK YOU