Graph Nde

Chapter - 4

Linear Equations In Two Variables

Linear Equations In One Variable :-

Linear equation of the form $ax+b=0$ where a and b are real numbers; $a \neq 0$.

(Eg) $3y+7=0$

$2x-8=0$

Linear Equations In Two Variables :-

Linear equation of the form $ax+by+c=0$, where a, b, c are real numbers; a and $b \neq 0$.

(Eg) $3x+2y-7=0$

$\sqrt{3}x-4y=8$

Note :-

* A linear equation in 2 variables has infinitely many solutions.
* The equation of x axis is $y=0$
* The equation of y axis is $x=0$
* An equation of the type $y=mx$ represent a line passing through the origin.
* The graph of every linear equation

in two variables is a straight line:

Exercise 4.1

1) The cost of a notebook is twice the cost of a pen. Write a linear equation in 2 variables to represent this statement.

Solution :-

Let the cost of the notebooks be ₹x
and cost of the pen be ₹y.

Given Cost of the notebooks = 2x (cost of a pen)

$$x = 2y$$

$$\Rightarrow x - 2y = 0$$

Ans :- $x - 2y = 0$

2) Express the following linear equation in the form $ax+by+c=0$ and indicate the values of a, b and c in each case.

i) $2x + 3y = 9.3\bar{5}$

Solution :-

$$2x + 3y = 9.3\bar{5}$$

$$2x + 3y - 9.3\bar{5} = 0 .$$

Ans:- $a=2,\ b=3,\ c=-9.3\overline{5}$

iv) $x=3y$

Solution:-

$$x=3y$$

$$x-3y=0$$

Ans:- $a=1,\ b=-3,\ c=0$

vi) $3x+2=0$.

Solution:-

$$3x+2=0$$

$$3x+0y+2=0$$

Ans:- $a=3,\ b=0,\ c=2$

H.W

Exercise 4.1

(2) → ii, iii, v, vii, viii

Exercise 4.2

1) Which one of the following option is true and why?

$y = 3x + 5$ has,

i) a unique solution

ii) only two solutions

iii) infinitely many solutions.

Solution:-

$y = 3x + 5$ has,

iii) infinitely many solutions

because for every value of x, there is a corresponding value of y and vice-versa.

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2) Write four solutions for each of the following equations:-

i) $2x + y = 7$

Solution:-

$$2x + y = 7$$

$$\Rightarrow \boxed{y = 7 - 2x} \quad \text{---} (1)$$

If $x = 0$,

$① \Rightarrow y = 7 - 2 \times 0$

$y = 7 - 0$

$\boxed{y = 7}$

If $x = 1$,

$① \Rightarrow y = 7 - 2 \times 1$

$y = 7 - 2$

$\boxed{y = 5}$

If $x = 2$,

$① \Rightarrow y = 7 - 2 \times 2$

$y = 7 - 4$

$\boxed{y = 3}$

If $x = 3$,

$① \Rightarrow y = 7 - 2 \times 3$

$y = 7 - 6$

$\boxed{y = 1}$

Ans:- The 4 solutions are (0,7), (1,5), (2,3) and (3,1)

ii) $\pi x + y = 9$

Solution :-

$$\pi x + y = 9$$

$$\Rightarrow \boxed{y = 9 - \pi x} \quad \text{---} (1)$$

If $x = 0$,

$$(1) \Rightarrow y = 9 - \pi \times 0$$

$$y = 9 - 0$$

$$\boxed{y = 9}$$

If $x = 1$, $x = 2$, $x = 3$. H.W .

iii) $x = 4y$

Solution :-

$$x = 4y$$

$$\Rightarrow \boxed{y = \frac{x}{4}} \quad \text{---} (1)$$

If $x = 1$,

$$(1) \Rightarrow \boxed{y = \frac{1}{4}}$$

If $x = 2$, $x = 4$, $x = 8$ H.W

3) Check which of the following are solutions of the equation $x-2y=4$ and which are not.

[H.W ii, iii, v]

i) (0, 2)

Solution:-

$$x-2y=4 \quad \text{---} (1)$$

Given $x=0, y=2$

Put $x=0$ and $y=2$ in (1),

LHS

$$0-2\times2 = 0-4 = -4$$

RHS

4

$\therefore$ LHS $\neq$ RHS.

Ans:- $\therefore$ (0, 2) is not the solution

ii) $(\sqrt{2}, 4\sqrt{2})$

Solution:-

$$x-2y=4 \quad \text{---} (1)$$

Given $x=\sqrt{2}, \ y=4\sqrt{2}$

Put $x=\sqrt{2}$ and $y=4\sqrt{2}$ in (1),

LHS

$$\sqrt{2} - 2 \times 4\sqrt{2} = \sqrt{2} - 8\sqrt{2}$$
$$= \sqrt{2}(1-8)$$
$$= -7\sqrt{2}.$$

RHS

4

$\therefore$ LHS $\neq$ RHS.

Ans: $\therefore$ $(\sqrt{2}, 4\sqrt{2})$ is not the solution.

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4) Find the value of k, if $x = 2$, $y = 1$ is a solution of the equation $2x + 3y = k$.

Solution:-

Given $x = 2$, $y = 1$ is a solution of

$$2x + 3y = k.$$

$$2x + 3y = k \quad \text{——} (1)$$

Put $x = 2$, $y = 1$ in (1),

$$(1) \Rightarrow 2 \times 2 + 3 \times 1 = k$$

$$4 + 3 = k$$

$$\Rightarrow \boxed{k = 7}$$

Ans:- The value of k is 7.

Exercise 4.3

2) Give the equations of two lines passing through (2, 14). How many more such lines are there and why?

Solution:-

Line 1 $7x - y = 0$

for $(2, 14) \rightarrow$ LHS $7x(2) - 14$

$= 14 - 14$

$= 0$

LHS = RHS

Line 2 $14x - 2y = 0$

for $(2, 14) \rightarrow$ LHS, $14 \times 2 - 2 \times 14$

$= 28 - 28$

$= 0$

LHS = RHS

Line 3 $\frac{x}{2} + \frac{y}{2} = 8$

for $(2, 14) \rightarrow$ LHS, $\frac{2}{2} + \frac{14}{2}$

$= 1 + 7$

$= 8$

LHS = RHS

Line 4 $x - y = -12$

for (2, 14), LHS, $2 - 14$

$= -12$

LHS. = RHS

There are infinitely many such lines because through a point infinite lines can be drawn.

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3) If the point (3, 4) lies on the graph of the equation, $3y = ax + 7$ find the value of a.

Solution :-

$$3y = ax + 7 \longrightarrow (1)$$

Since (3, 4) lies on graph of $3y = ax + 7$,

put (3, 4) in (1).

$(1) \Rightarrow 3 \times 4 = a \times 3 + 7 \quad [x = 3, y = 4]$

$12 = 3a + 7$

$3a = 12 - 7$

$3a = 5$

$\Rightarrow \boxed{a = \frac{5}{3}}$

Ans:- Value of a is $\frac{5}{3}$

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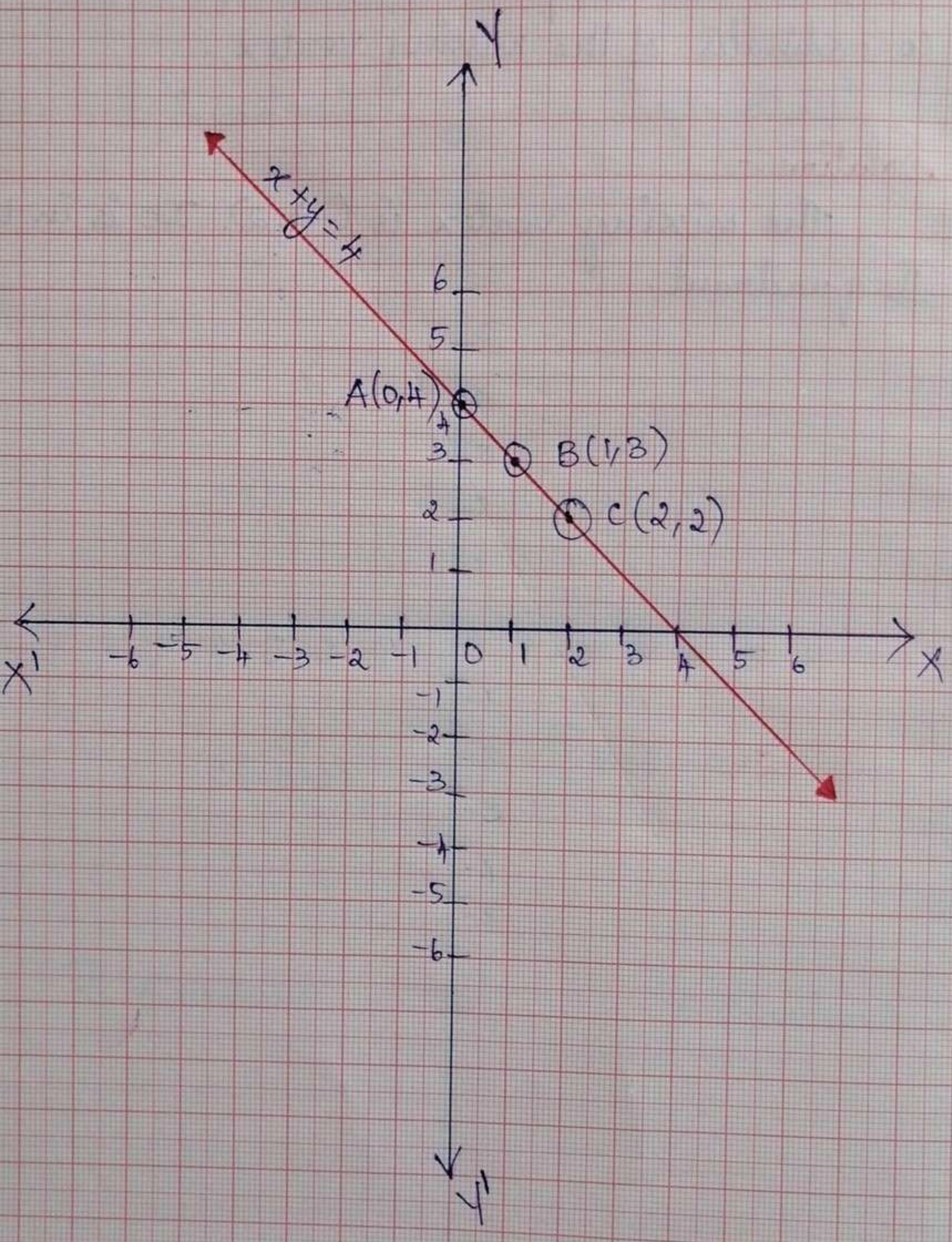
Scale

In x axis, 1cm = 1 unit

In y axis, 1cm = 1 unit



Exercise 4.3

1) Draw the graph of each of the following linear equations in two variables.

i) $x+y=4$

Solution :-

$$x+y=4$$

$$\boxed{y=4-x} \quad \text{---} (1)$$

When $x=0$,

$$(1) \Rightarrow y=4-0$$

$$\boxed{y=4}$$

When $x=1$,

$$(1) \Rightarrow y=4-1$$

$$\boxed{y=3}$$

When $x=2$,

$$(1) \Rightarrow y=4-2$$

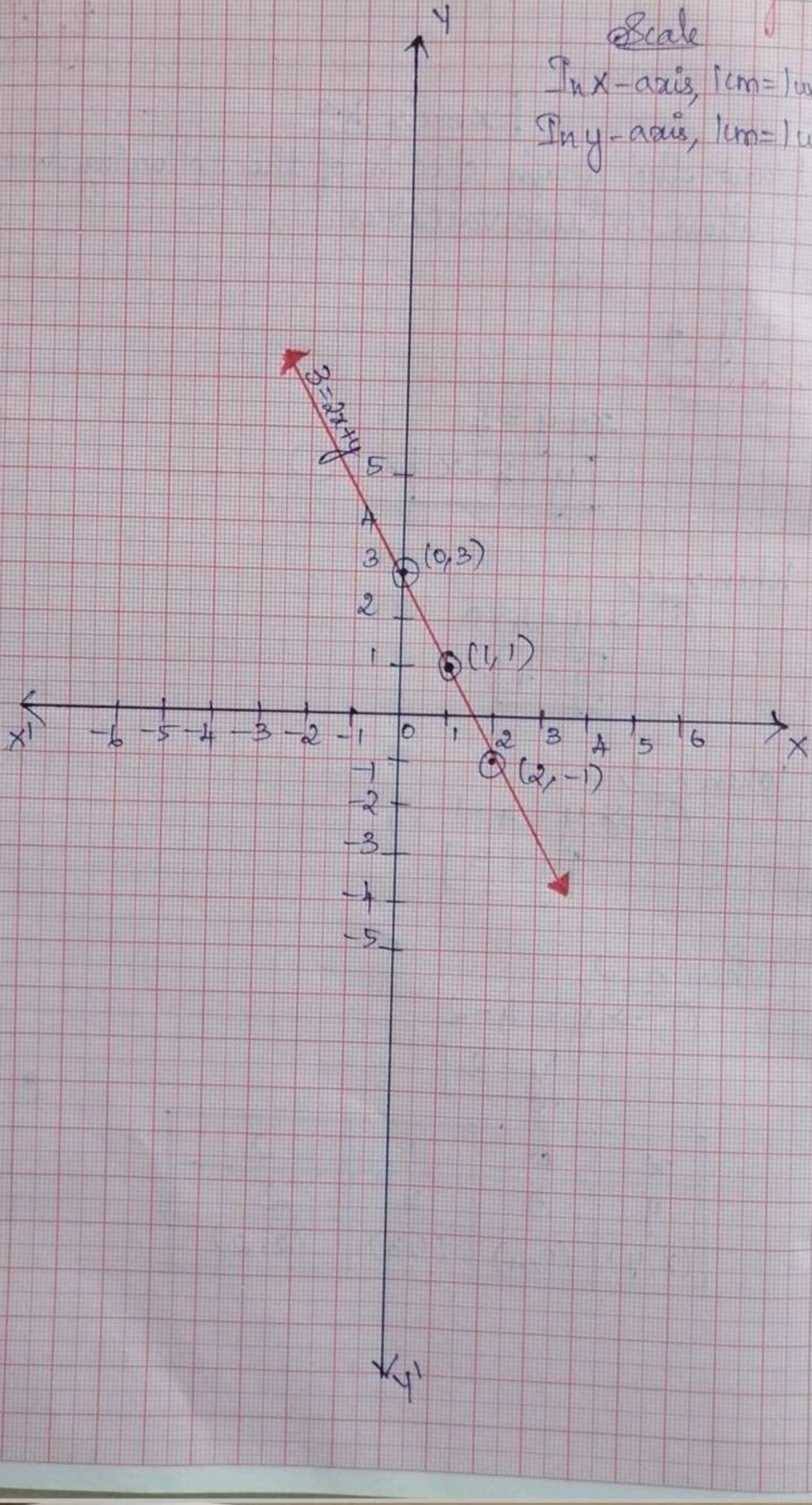
$$\boxed{y=2}$$

x	0	1	2
y	4	3	2
(x,y)	$(0,4)$	$(1,3)$	$(2,2)$

Scale

In x-axis, 1cm = 1 unit

In y-axis, 1cm = 1 unit



iv) $3 = 2x + y$

Solution:-

$$3 = 2x + y$$

$$\boxed{y = 3 - 2x} \quad \text{---} \quad (1)$$

When $x = 0$,

$$(1) \Rightarrow y = 3 - 2 \times 0$$

$$y = 3 - 0$$

$$\boxed{y = 3}$$

When $x = 1$,

$$(1) \Rightarrow y = 3 - 2 \times 1$$

$$y = 3 - 2$$

$$\boxed{y = 1}$$

When $x = 2$,

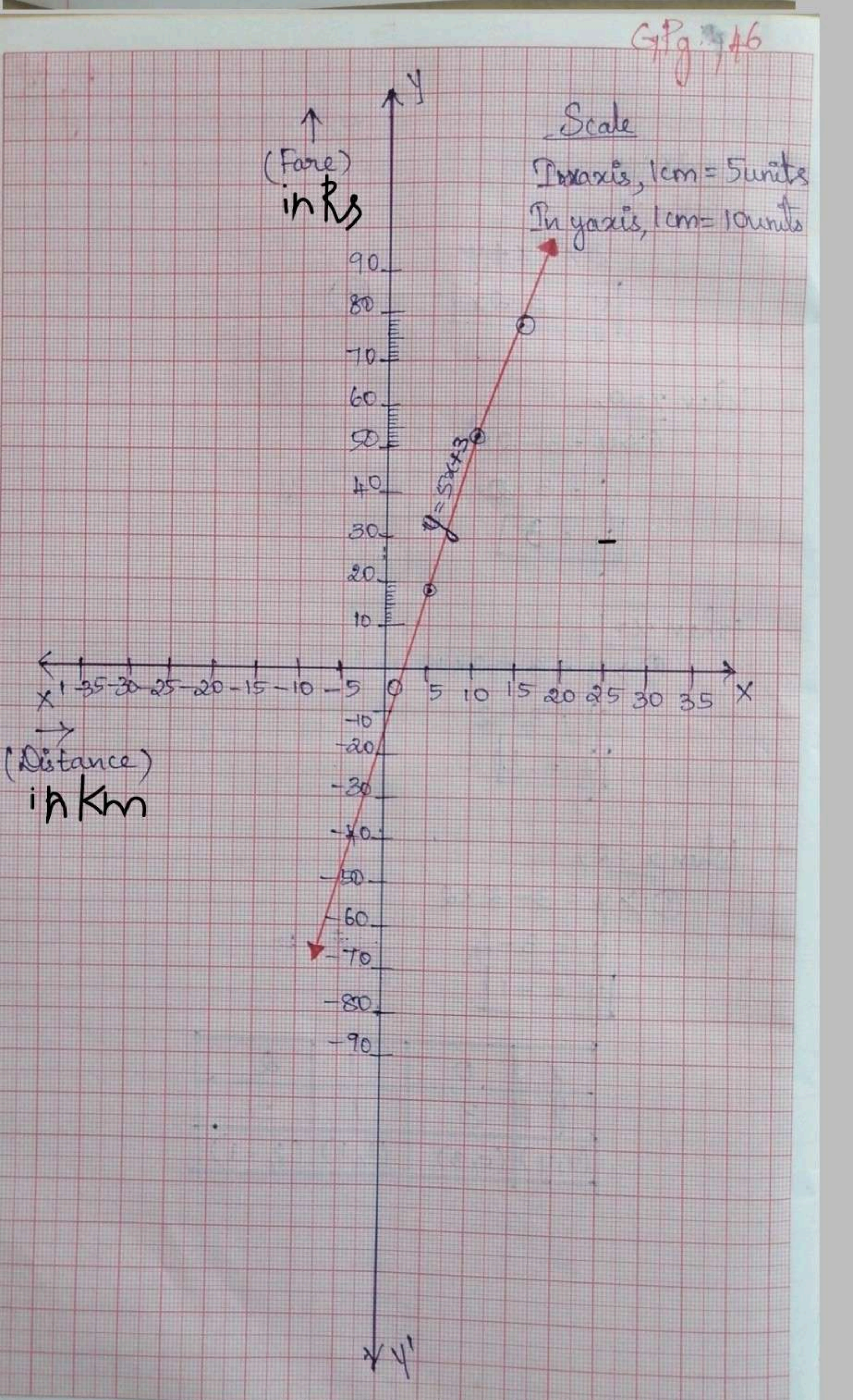
$$(1) \Rightarrow y = 3 - 2 \times 2$$

$$y = 3 - 4$$

$$\boxed{y = -1}$$

x	0	1	2
y	3	1	-1
(x, y)	$(0, 3)$	$(1, 1)$	$(2, -1)$

GPg. No. 46


y
(Fare)
in Rs
Scale
In x axis, 1 cm = 5 units
In y axis, 1 cm = 10 units
90
80
70
60
50
40
30
20
10
y = 5x + 3
x
-35 -30 -25 -20 -15 -10 -5 0 5 10 15 20 25 30 35
-10
-20
-30
-40
-50
-60
-70
-80
-90
(Distance)
in km
y'

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Solution :-

The total distance covered = x km

total fare = ₹ y.

fare for the first 1km = ₹ 8.

Subsequent (Remaining) distance = (x-1) km

Given fare for subsequent distance = ₹ 5 / km

∴ Total fare for remaining distance

= ₹ (x-1) 5

According to the question,

$y = 8 + (x-1)5$

$y = 8 + 5x - 5$

$\Rightarrow \boxed{y = 5x + 3} \quad \text{---} (1)$

If $x = 5$,

$(1) \Rightarrow y = 5 \times 5 + 3$

$y = 25 + 3$

$y = 28$

If $x = 10$,

$(1) \Rightarrow y = 5 \times 10 + 3$

$y = 50 + 3$

$y = 53$

If $x = 15$,

$(1) \Rightarrow y = 5 \times 15 + 3$

$y = 75 + 3$

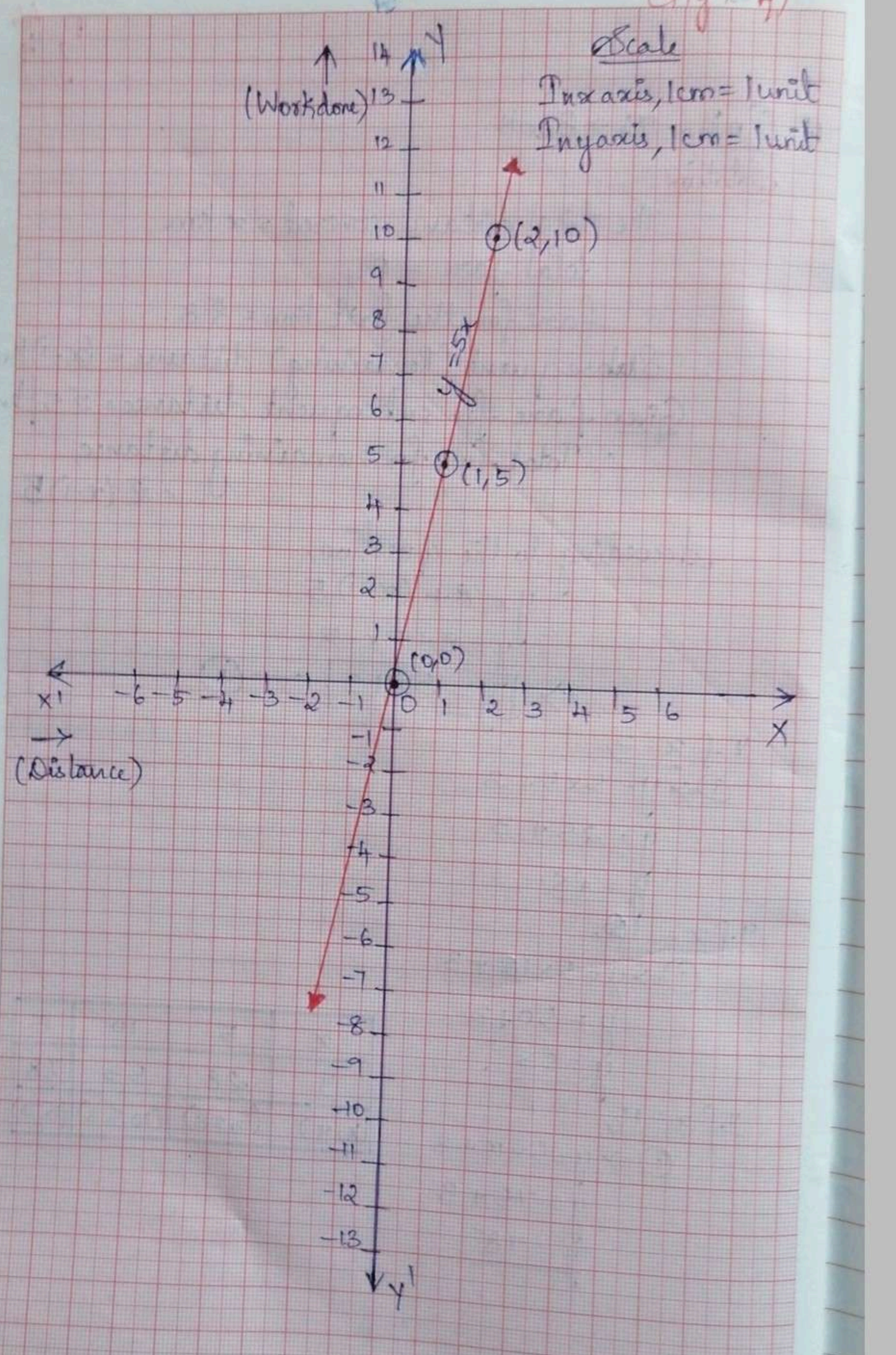
$y = 78$

x	5	10	15
y	28	53	78
(x, y)	(5, 28)	(10, 53)	(15, 78)

Scale

1 m x axis, 1 cm = 1 unit

1 m y axis, 1 cm = 1 unit



6) Solution:-

Let the work done by constant body be y and the distance travelled by body be x.

Constant force = 5 units

Work done = force x displacement

$y = 5 \times x$

$\boxed{y = 5x}$ — (1)

i) Work done in 2 units of distance is $y = 5 \times 2$ [from (1)]

$y = 10$ units

ii) Work done in 0 units of distance is $y = 5 \times 0$ [from (1)]

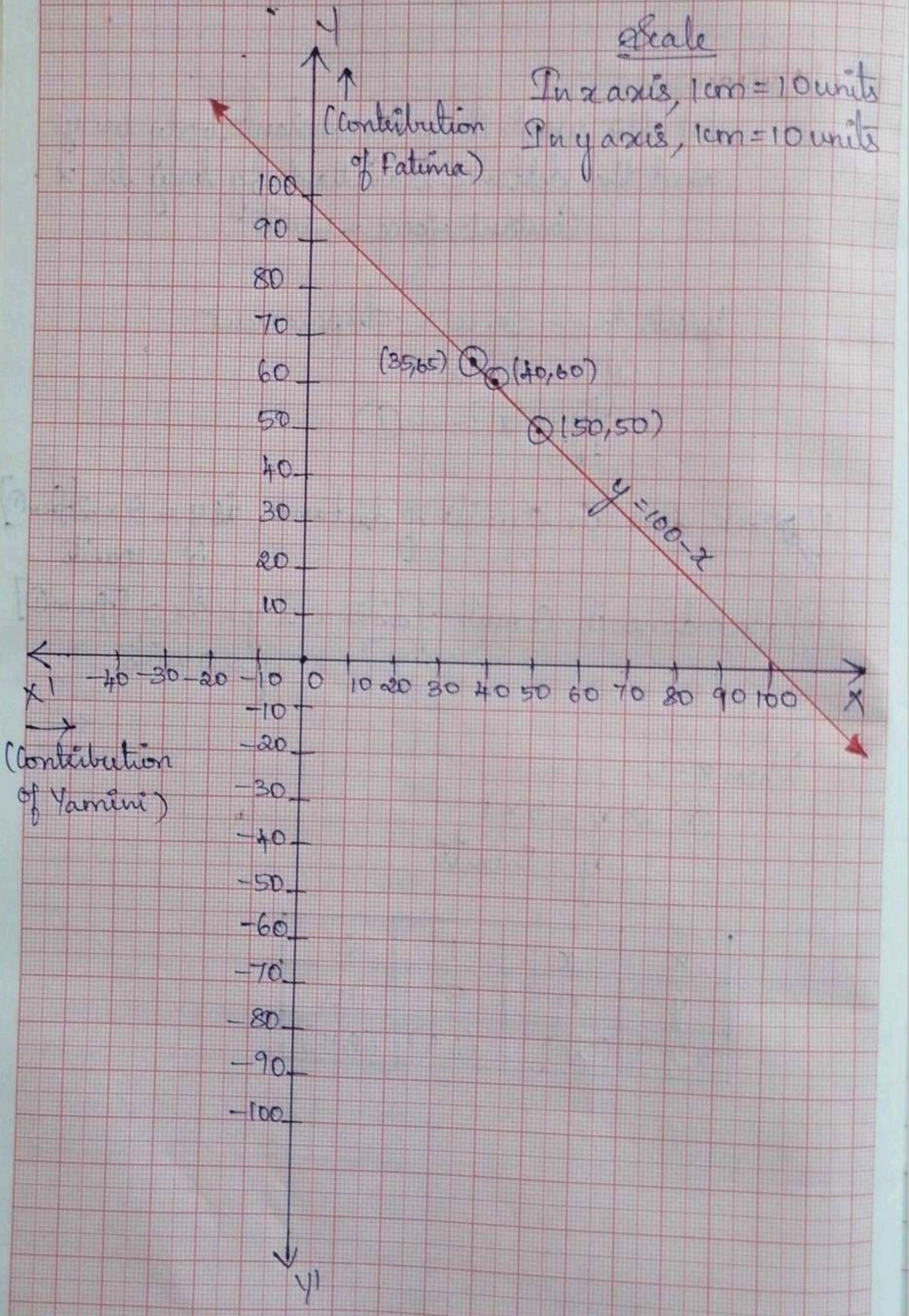
$y = 0$ units

When $x = 1$,

(1) $\Rightarrow y = 5 \times 1$

$y = 5$ units

x	0	1	2
y	0	5	10
(x, y)	(0, 0)	(1, 5)	(2, 10)



Scale

In x axis, 1cm = 10 units

In y axis, 1cm = 10 units

7) Solution :-

Let the contribution of Yamini be x ₹
Let the contribution of Fatima be y ₹

Total Contribution = ₹100.

According to the question,

$x + y = 100$

$\boxed{y = 100 - x}$ — (1)

When $x = 35$,

(1) $\Rightarrow y = 100 - 35$

$y = 65$

When $x = 40$,

(1) $\Rightarrow y = 100 - 40$

$y = 60$

When $x = 50$,

(1) $\Rightarrow y = 100 - 50$

$y = 50$

x	35	40	50
y	65	60	50
(x, y)	(35, 65)	(40, 60)	(50, 50)

(x, y)	(35,65)	(40,60)	(50,50)

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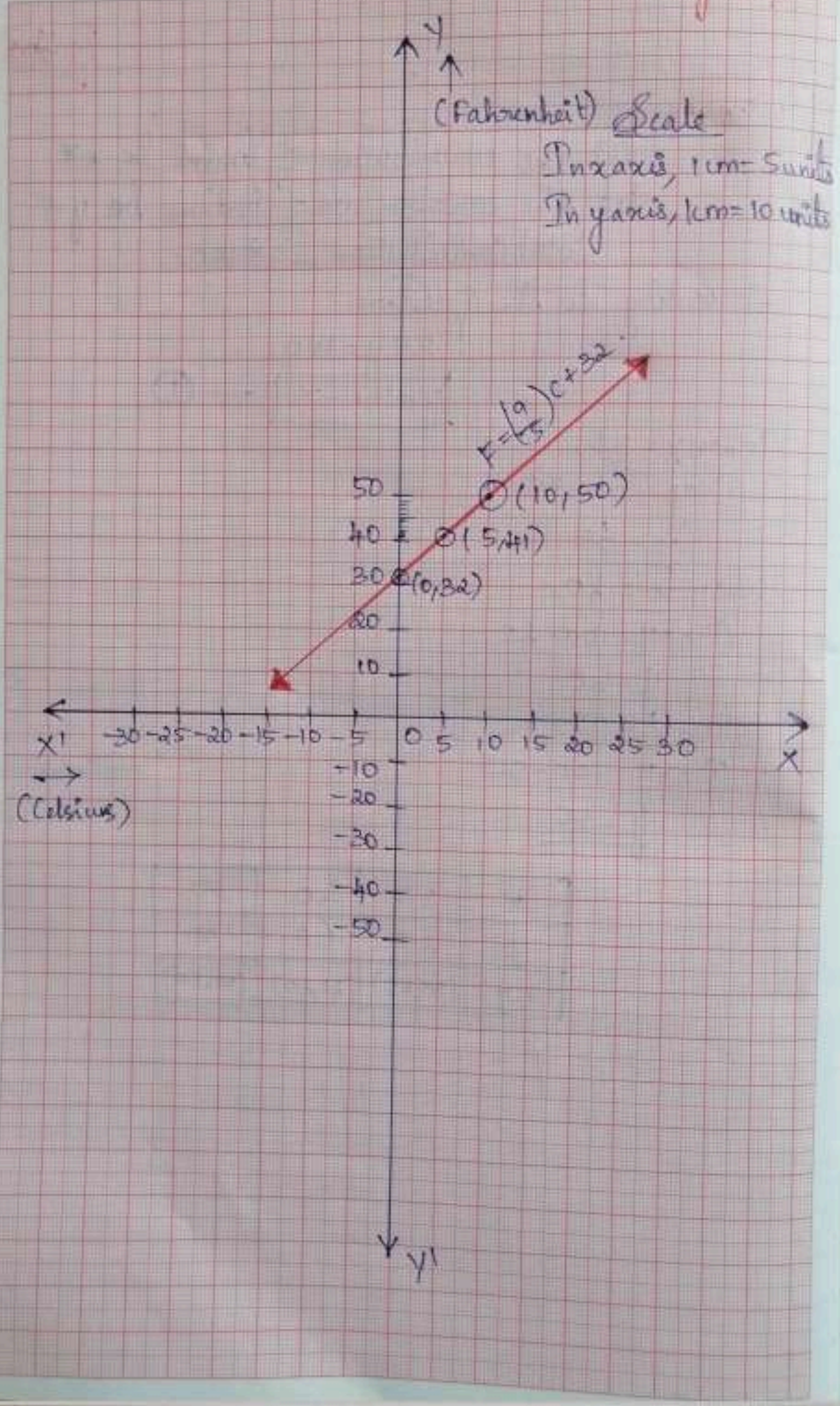

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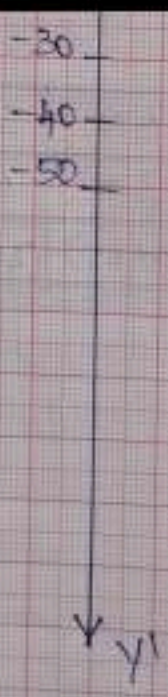
Solution :-

i) $F^\circ = \left(\frac{9}{5}\right) C^\circ + 32$ — (1)



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8) Solution :-

i) $F^\circ = \left(\frac{9}{5}\right) C^\circ + 32$ — (1)

C	x	5	10	0
F	y	41	50	32
(C, F)	(x, y)	(5, 41)	(10, 50)	(0, 32)

ii) If $C = 30^\circ$,

(1) $\Rightarrow F = \left(\frac{9}{5}\right)30 + 32$

$F = 86$

iii) If $F = 95^\circ$

(1) $\Rightarrow C = (F - 32)\frac{5}{9}$

$= (95 - 32) \times \frac{5}{9}$

$= 63 \times \frac{5}{9}$

$C = 35^\circ$.

iv) If $C = 0^\circ$, $F = 32^\circ$

If $F = 0^\circ$, $C = (F - 32)\frac{5}{9}$

$= (0 - 32) \times \frac{5}{9}$

$= -32 \times \frac{5}{9}$

$C = \frac{-160}{9}$

v) Let $F^\circ = C^\circ = x$

(1) $\Rightarrow x = \left(\frac{9}{5}\right)x + 32$

$x - \frac{9}{5}x = 32$

$\frac{5x - 9x}{5} = 32$

$-4x = 160$

$x = -40$.

$x = 5$,

(1) $\Rightarrow y = \frac{9}{5} \times 5 + 32$

$= 9 + 32$

$y = 41$

$x = 10$,

(1) $\Rightarrow y = \frac{9}{8} \times 10 + 32$

$= 18 + 32$

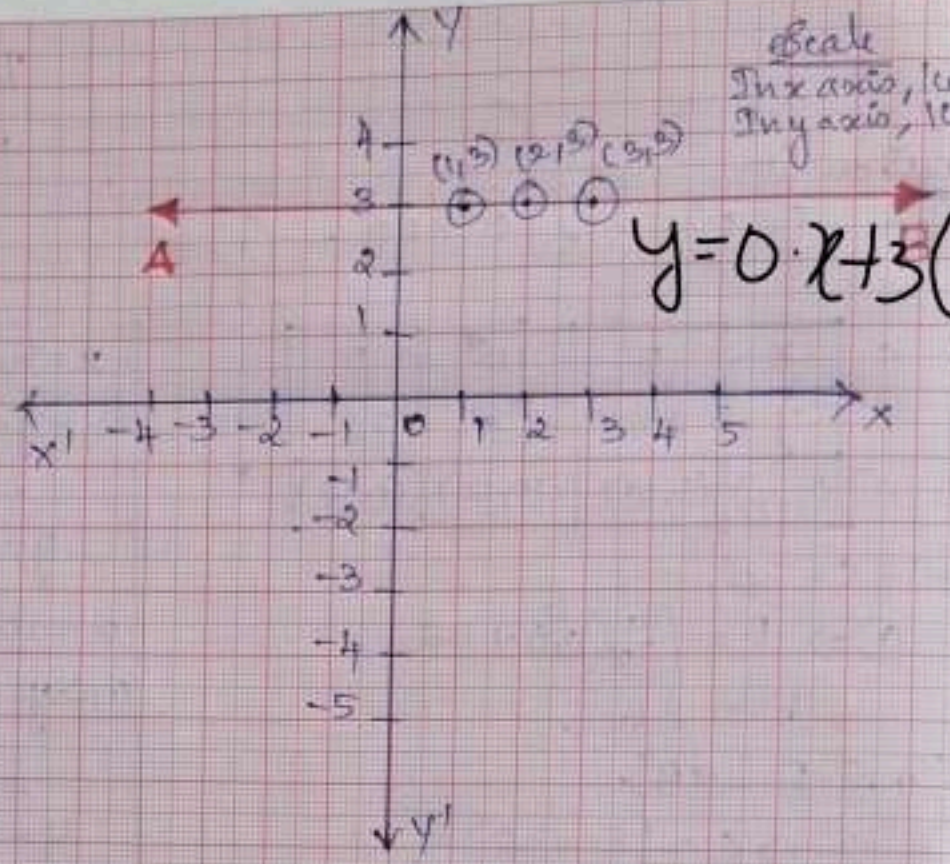
$y = 50$

$x = 0$,

(1) $\Rightarrow y = \frac{9}{5} \times 0 + 32$

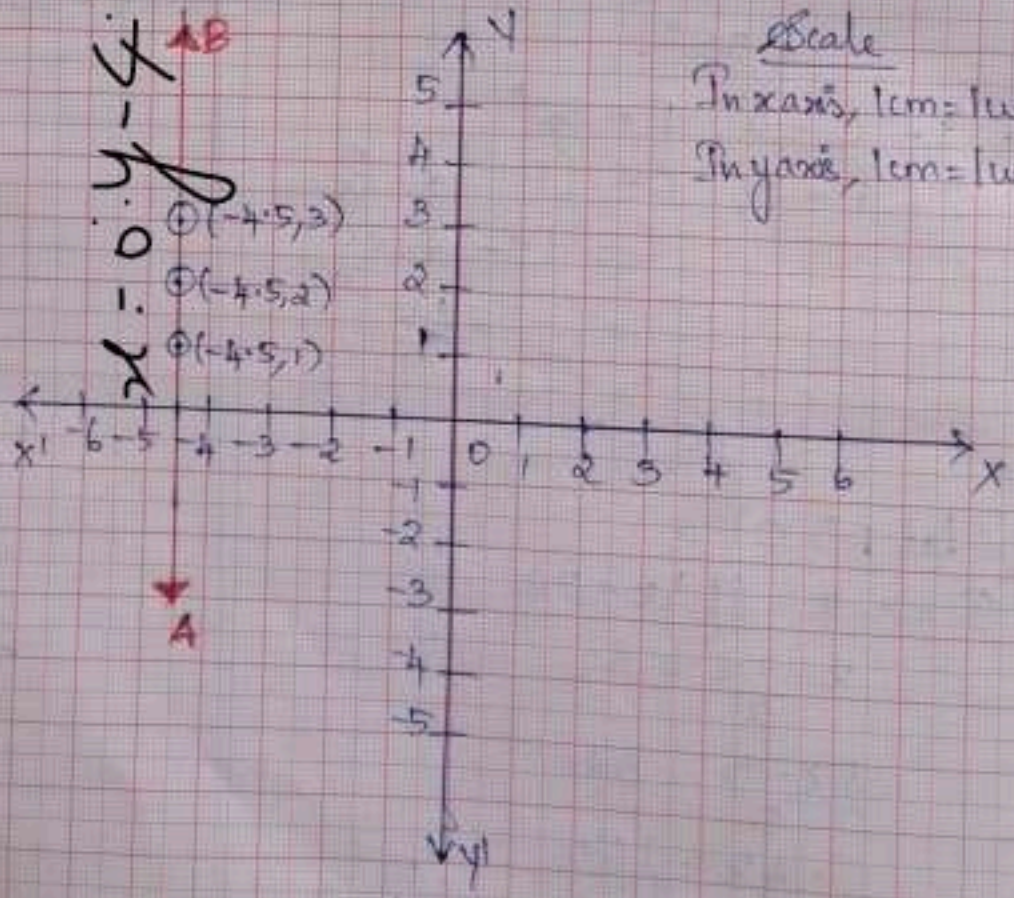
$y = 32$.

i)



$y = 0 \cdot x + 3 \quad (y = 3,$

ii)



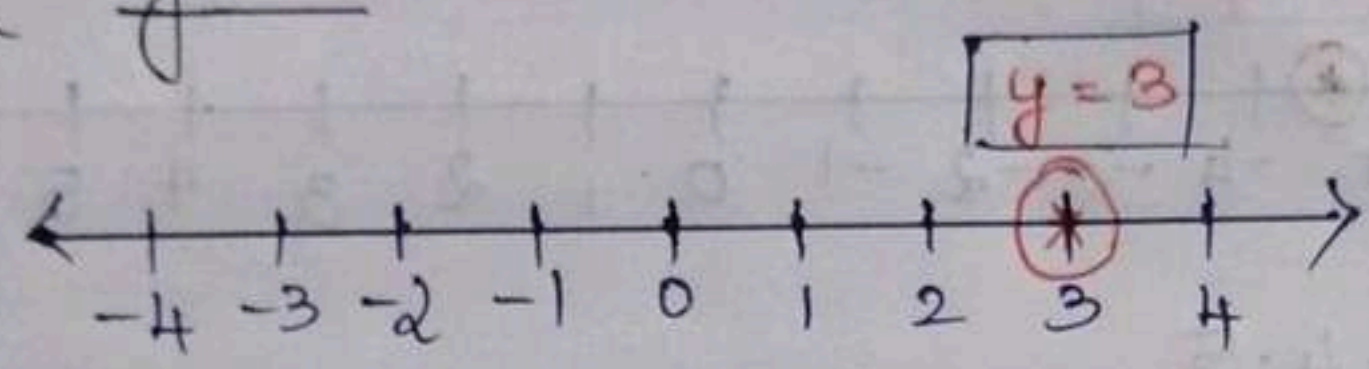
$x = 0 \cdot y - 4 \cdot 5$

Exercise 4.4

1) Give the geometric representation of $y = 3$ as an equation
   i) in one variable (Number line)
   ii) in two variables (Cartesian Plane)

Solution :-

i) $y = 3$



ii) $y = 3$

$y = 0.x + 3$

x	1	2	3
y	3	3	3
(x, y)	(1, 3)	(2, 3)	(3, 3)

from the graph we observed that line AB is parallel to x-axis at a distance of 3 units above it.

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2) Give the geometric representation of $2x + 9 = 0$ as an equation
   i) in one variable
   ii) in two variables.

Solution :-

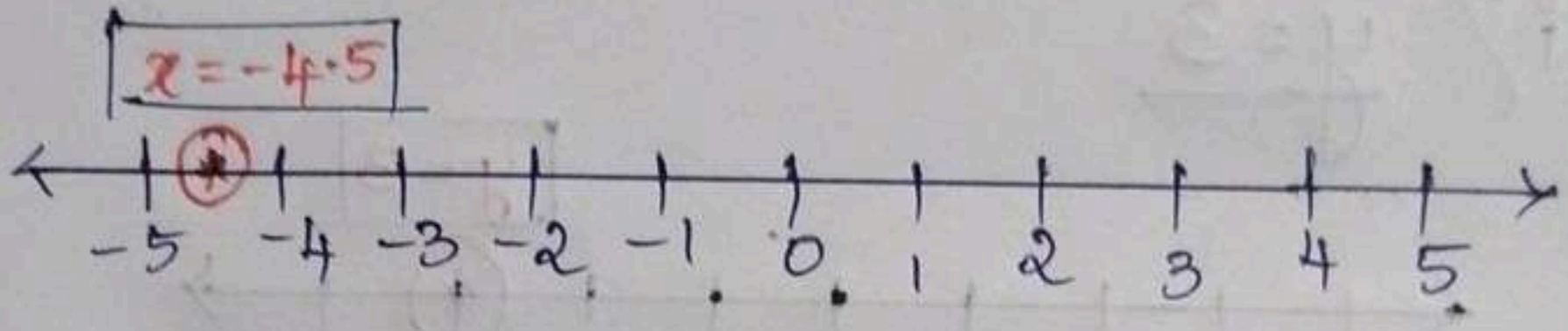
i) $2x + 9 = 0$

$2x = 0 - 9$

$x = \frac{-9}{2}$

$x = -4.5$

$x = -4.5$



ii) $x = -4.5$

$x = 0.y - 4.5$

x	-4.5	-4.5	-4.5
y	1	2	3
(x, y)	$(-4.5, 1)$	$(-4.5, 2)$	$(-4.5, 3)$

From the graph, we observed that AB is parallel to y-axis, at a distance of 4.5 units to the left of origin.