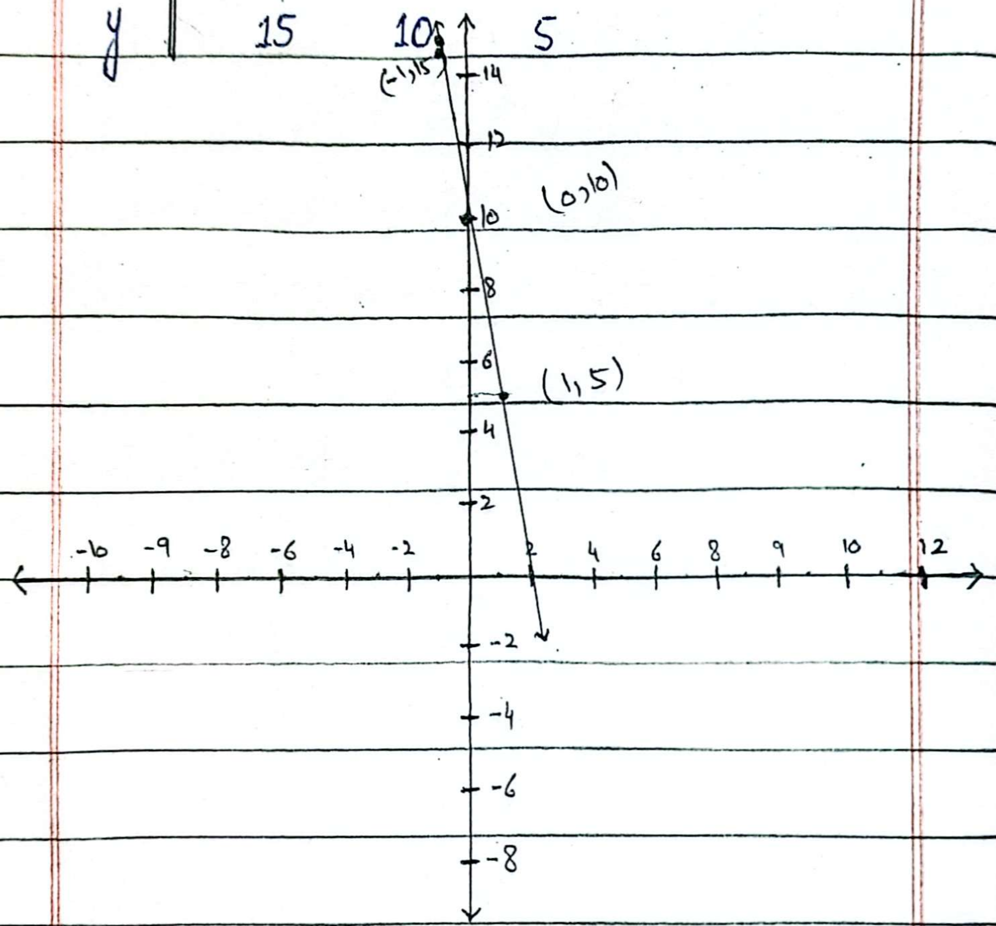
Date: Ex # 2.2

Q1_ Find the point of intersection of coordinate axes & following linear function graphically?

Sol_ (i) $y = -5x + 10$?

x	-1	0	1
y	15	10	5



Hence, from above graphs, the points (0,10) and (2,0) are point of intersection at axes.

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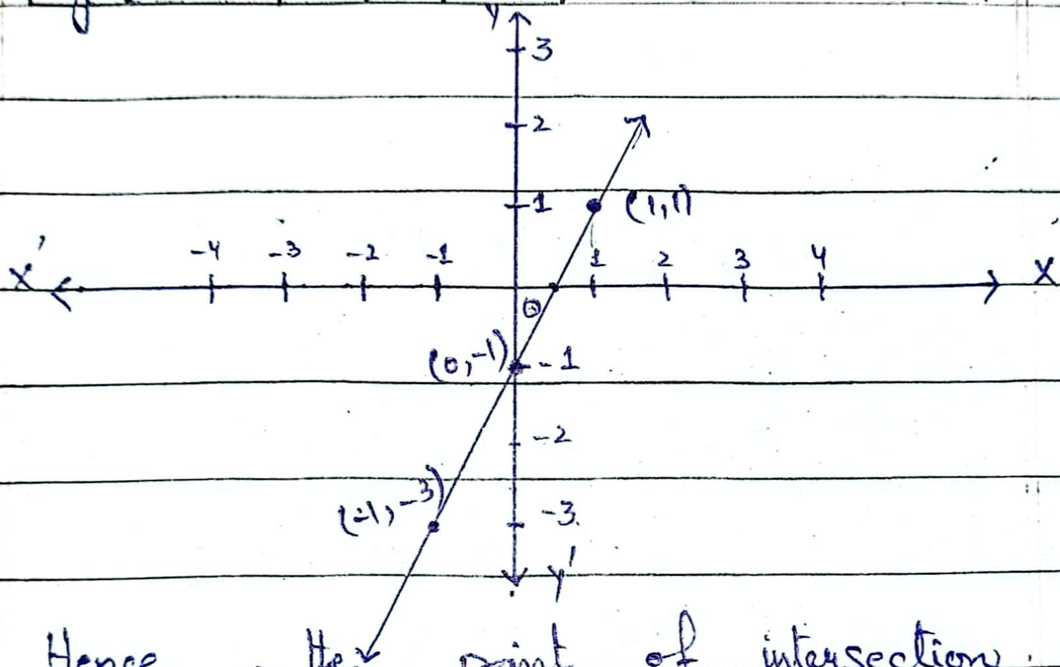
(ii) $y = 2x - 1$?

x	-1	0	1
y	-3	-1	1

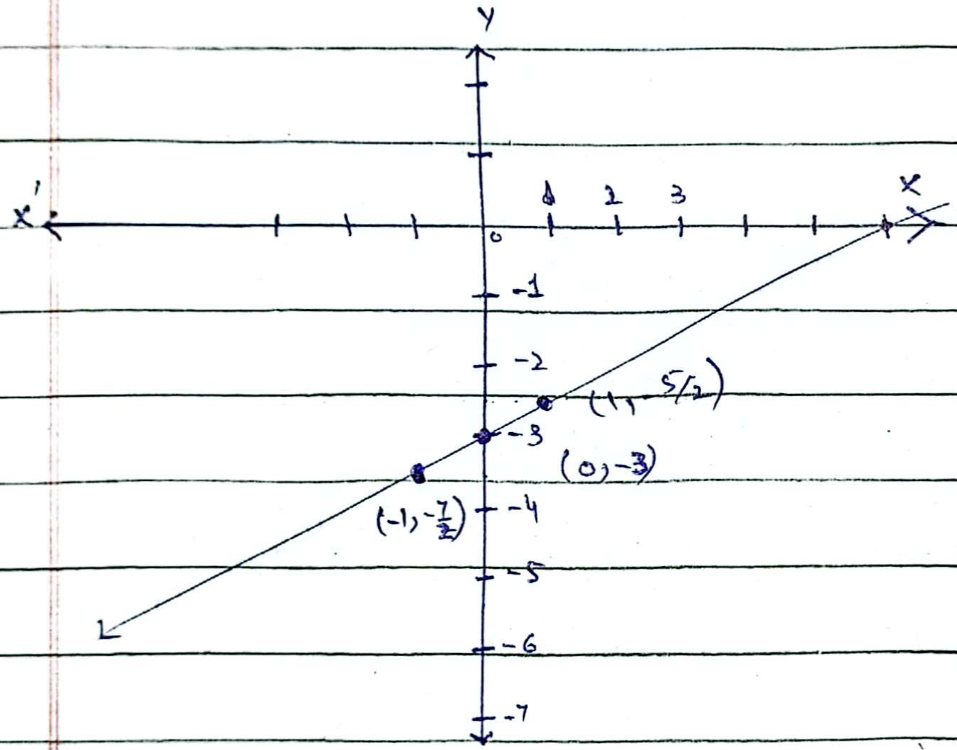


Hence, the point of intersection ~~Between~~ at co-ordinate axes are $(0.5, 0)$ and $(0, -1)$.

Date:

(iii) $y = \frac{1}{2}x - 3$?

x	-1	0	1
y	$-7/2$	-3	$-5/2$



Hence, (6, 0) and (0, −3) are point of intersection.

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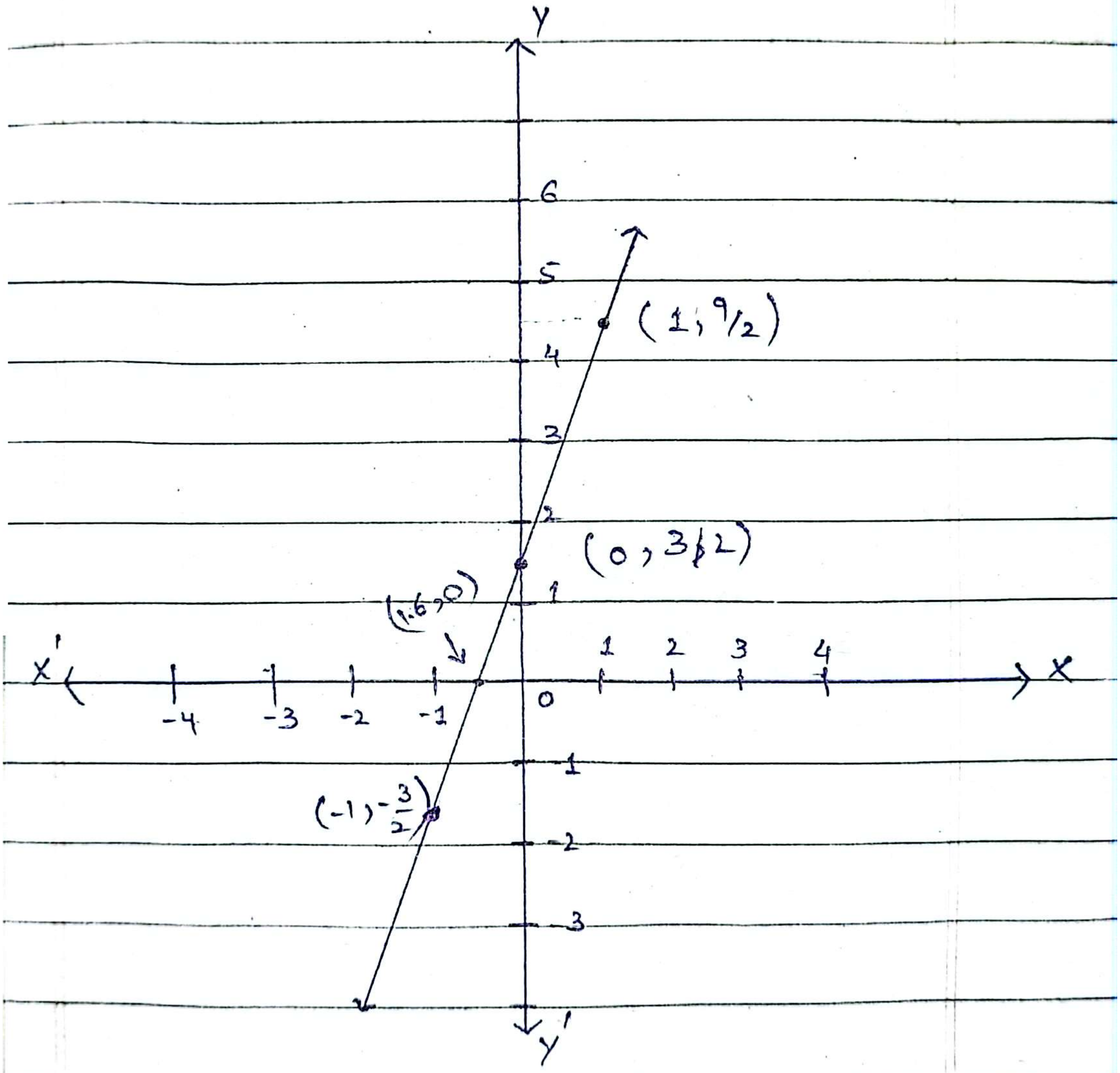
(iv) $y = 3x + \frac{3}{2}$

x	-1	0	1
y	$-3/2$	$3/2$	$9/2$



Hence point of intersection at axes are $(0, 3/2)$ and $(1.6, 0)$.

Date:

Q2_ Find the points of intersection of following Juction graphically :

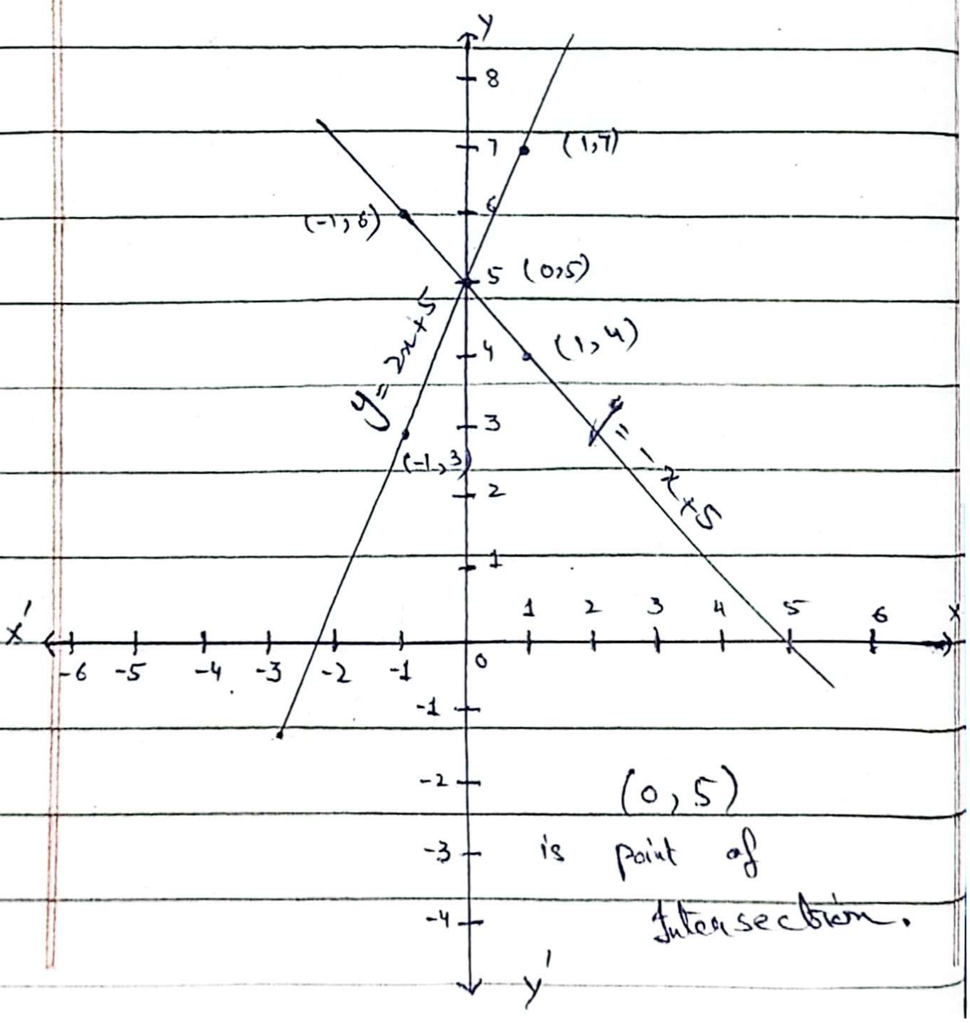
(i) $f(x) = 2x+5$

Sol_ $g(x) = -x+5$?

$\because f(x) = y$

$g(x) = y$

x	$y = 2x+5$	$y = -x+5$
-1	3	6
0	5	5
1	7	4



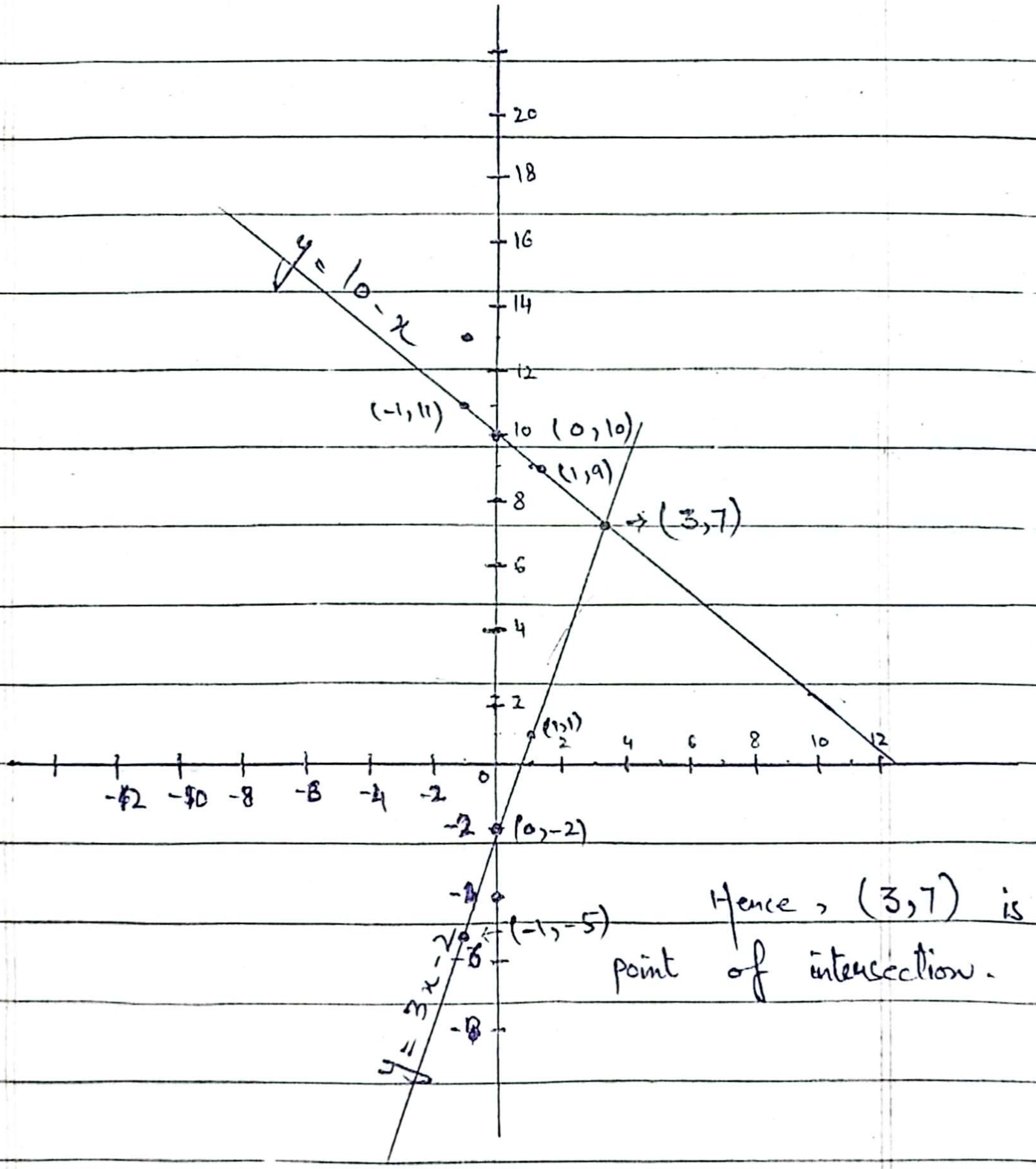
$(0, 5)$ is point of intersection.

Date:

(ii) $f(x) = 3x - 2$

$g(x) = 10 - x$?

x	$y = 3x - 2$	$y = 10 - x$
-1	-5	11
0	-2	10
1	1	9



Hence, (3, 7) is point of intersection.

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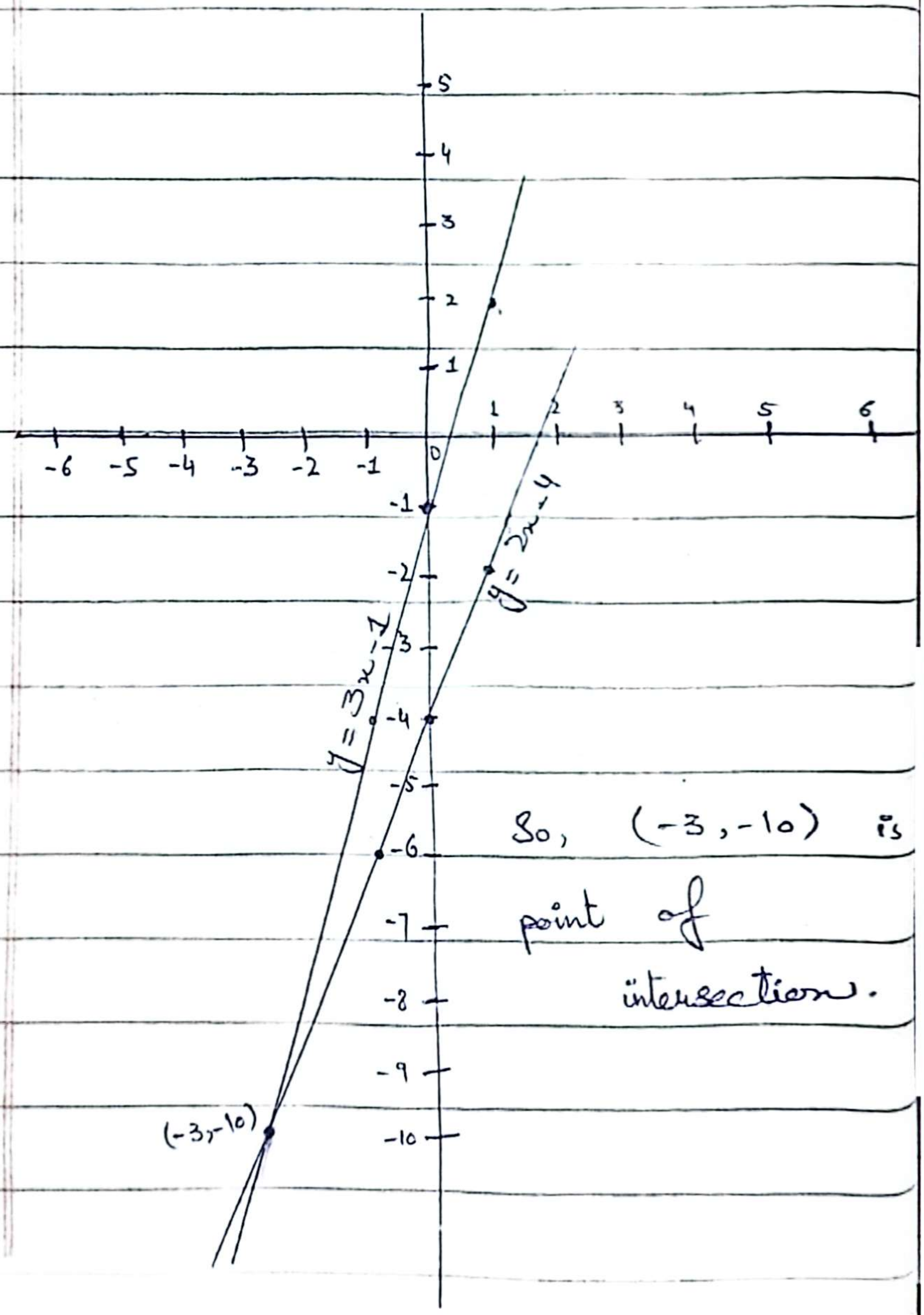
(iii) $f(x) = 2x - 4$

$g(x) = 3x - 1$?

x	$y = 2x - 4$	$y = 3x - 1$
-1	-6	-4
0	-4	-1
1	-2	2



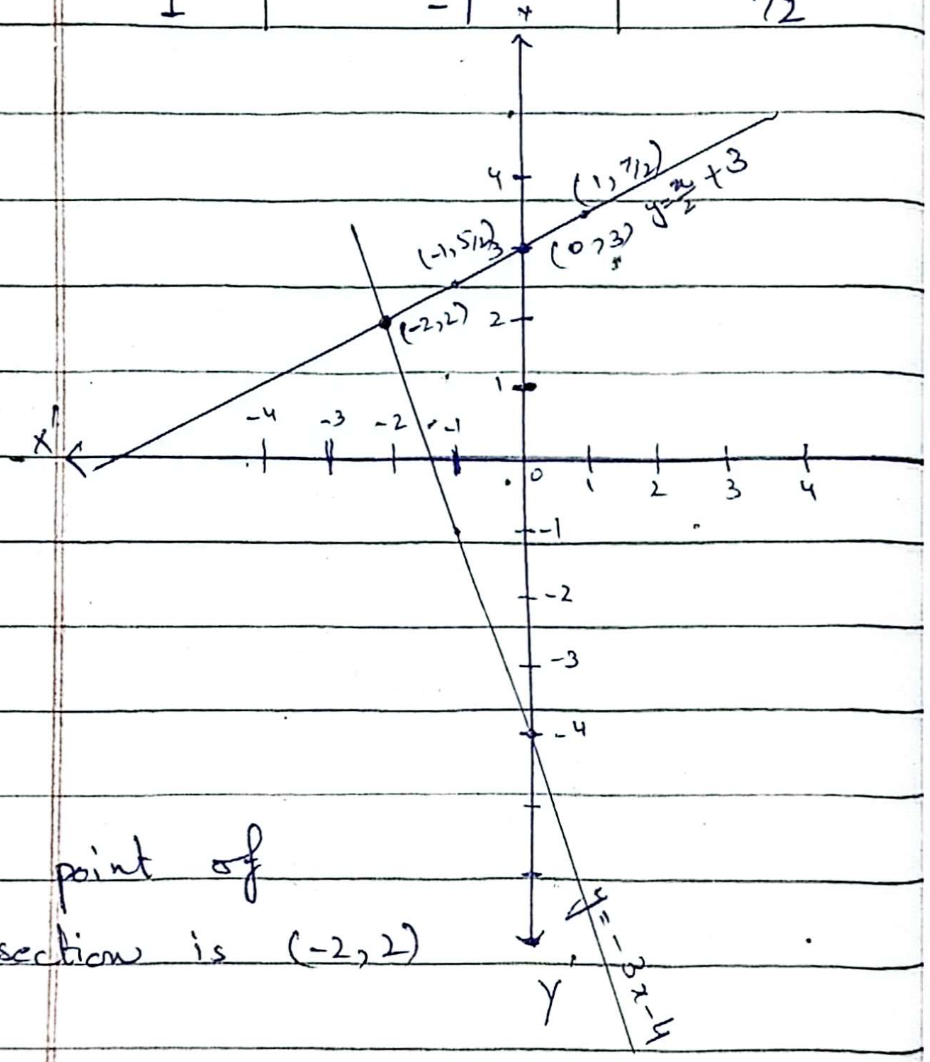
So, $(-3, -10)$ is point of intersection.

Date:

(iv) $f(x) = -3x - 4$

$g(x) = \frac{1}{2}x + 3$?

x	$y = -3x - 4$	$y = \frac{x}{2} + 3$
-1	-1	$5/2$
0	-4	3
1	-7	$7/2$



So, point of intersection is $(-2, 2)$

$$\left[\begin{array}{l} \because\ y = x-1 \\ \text{at } \underset{\sim}{x=0} \Rightarrow y = 0-1 = \underset{\sim}{-1} \\ \text{at } \underset{\sim}{y=0} \Rightarrow 0 = x-1 \Rightarrow \underset{\sim}{x=1} \end{array}\right]$$

Date: ____________

(v) $f(x) = x-1$

$g(x) = x^2-4x+3$?

Sol- For ; $y = f(x) = x-1$

$(1,0)$ and $(0,-1)$ $\left(\begin{array}{l}\because f(x)=y \\ g(x)=y\end{array}\right)$

are x-intercept and y-intersept.

Now,

$$y = x^2 - 4x + 3$$

put $x=0$

$$y = (0)^2 - 4(0) + 3$$

$$y = 3 \quad \Rightarrow \quad (0,3)$$

put $y=0$

$$0 = x^2 - 4x + 3$$

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

By quadratic Formula,

$a = 1$, $b = -4$, $c = 3$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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

$$= \frac{4 \pm \sqrt{16-12}}{2}$$

Date:

$$= \frac{4 \pm \sqrt{4}}{2}$$

$$x = \frac{4 \pm 2}{2}$$

$$x = \frac{4+2}{2}, \quad x = \frac{4-2}{2}$$

$$= \frac{6}{2}, \quad = \frac{2}{2}$$

$$x = 3, \quad x = 1$$

So, $(3, 0)$ and $(1, 0)$ are x-intersept

Now we find vertex (h, k) of parabola.

$$h = \frac{-b}{2a} = \frac{-(-4)}{2(1)} = \frac{4}{2} = 2$$

$$k = f(h) = f(2).$$

$$= (2)^2 - 4(2) + 3$$

$$= 4 - 8 + 3$$

$$k = -1$$

$\Rightarrow$ Vertex $= (2, -1)$

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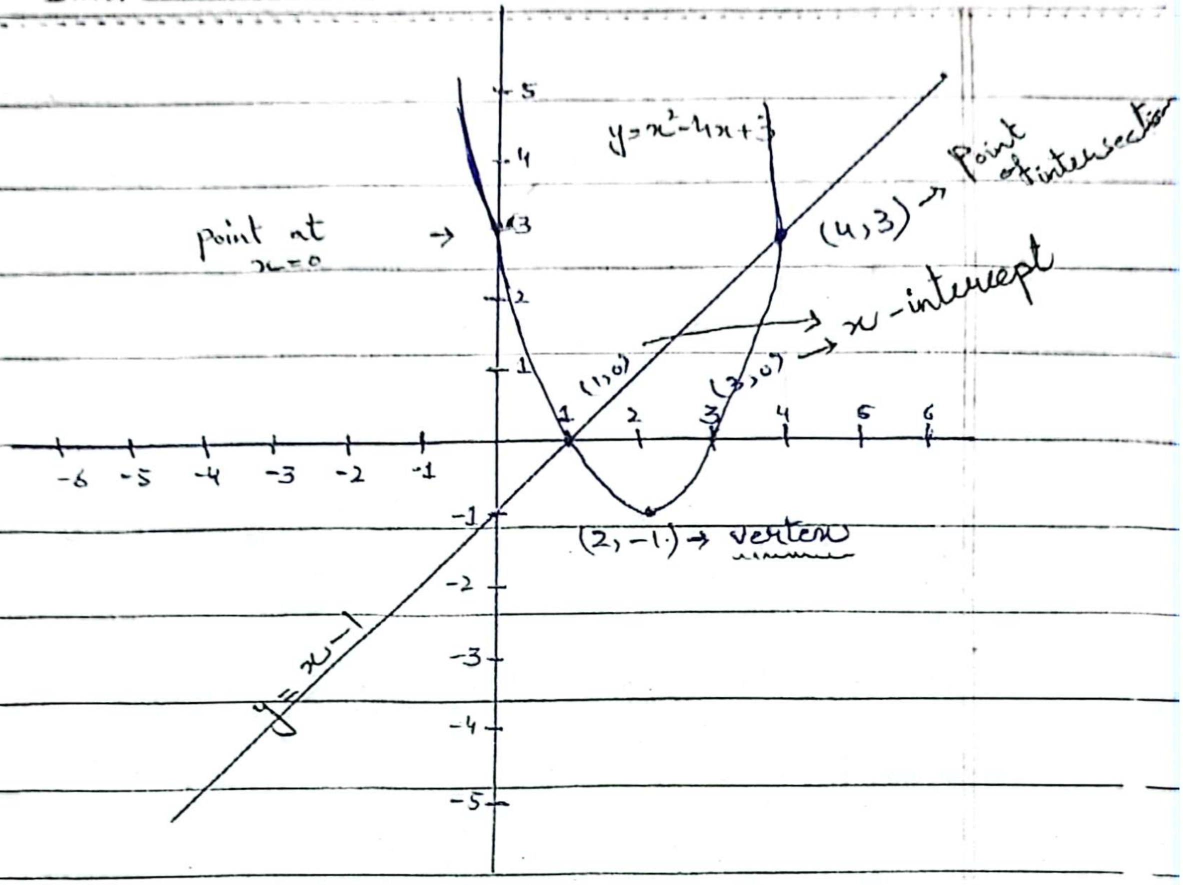

Hence $(4,3)$ and $(1,0)$ are points of intersection.

Date:

(vi)_ $f(x) = 3x + 4$

$g(x) = x^2 + 2x - 8$?

Sol_ * For, $y = 3x + 4$

at $x = 0 \Rightarrow y = 4$

at $y = 0 \Rightarrow 0 = 3x + 4$

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

Hence $\left(-\frac{4}{3}, 0\right)$ and $(0, 4)$

are x-intercept & y-intercept.

* Let

$y = x^2 + 2x - 8$

at $x = 0$

$y = \cancel{(0)^2} + \cancel{2(0)} - 8$

$y = -8 \Rightarrow \boxed{(0, -8)}$

at $y = 0$

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

By quadratic formula,

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$a = 1$, $b = 2$, $c = -8$

$x = \frac{-2 \pm \sqrt{(2)^2 - 4(1)(-8)}}{2(1)}$

$= \frac{-2 \pm \sqrt{4 + 32}}{2}$

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$$= \frac{-2 \pm \sqrt{36}}{2} = \frac{-2 \pm 6}{2}$$

$x = \frac{-2+6}{2}$	$x = \frac{-2-6}{2}$
$= \frac{4}{2}$	$x = \frac{-8}{2}$
$x = 2$	$x = -4$

So, $(2,0)$ and $(-4,0)$ are x-intercepts.

Now we find vertex (h,k).

$$h = \frac{-b}{2a} = \frac{-2}{2(1)} = -1$$

$$K = f(h) = f(-1)$$

$$= (-1)^2 + 2(-1) - 8$$

$$= 1 - 2 - 8$$

$$K = -9$$

$\Rightarrow$ Vertex $= (-1,-9)$

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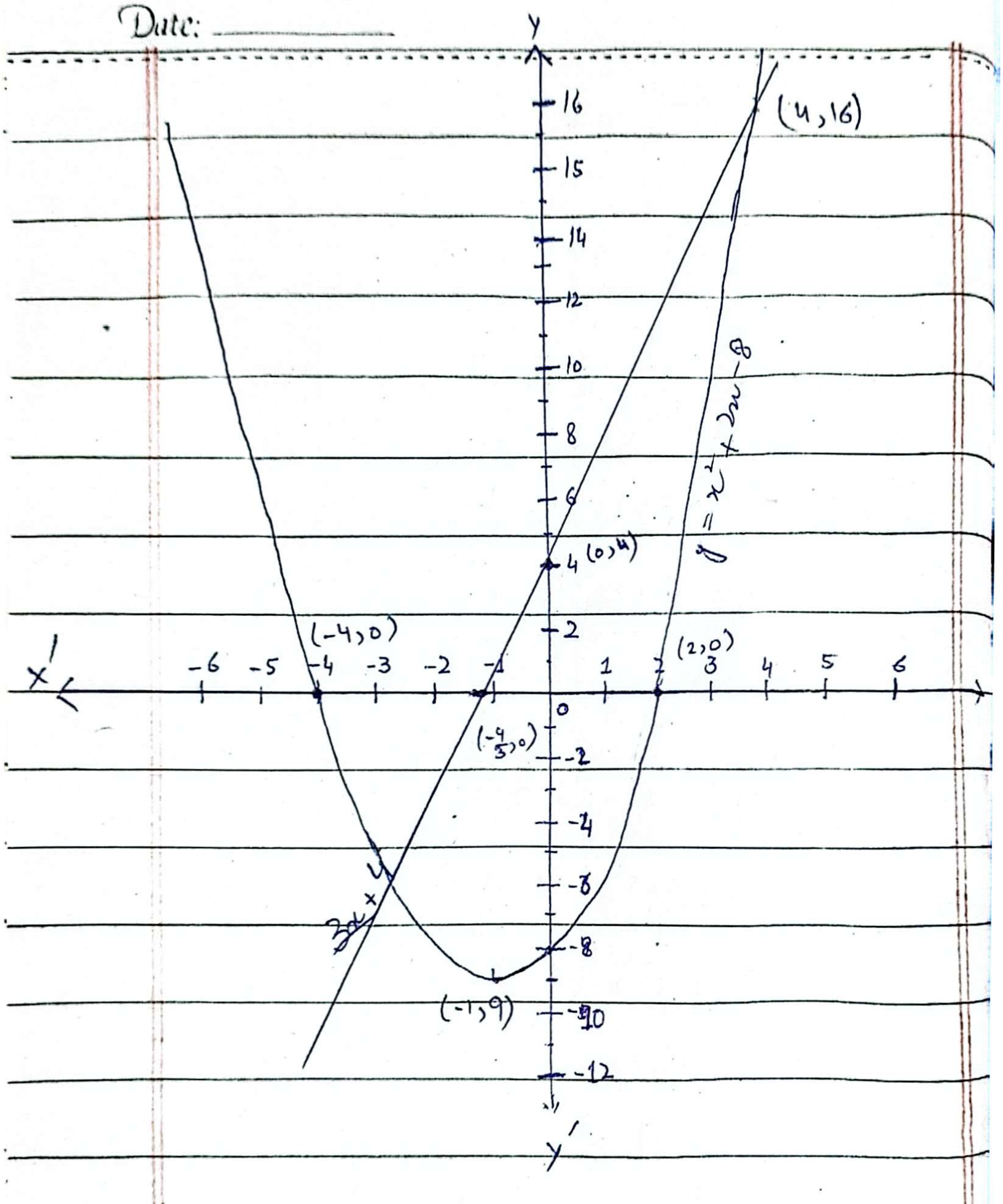

Y
16
15
14
12
10
8
6
4 (0,4)
2
(4,16)
$y = x^2 + 2x - 8$
(-4,0)
(2,0)
X'
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6
$(-\frac{4}{3}, 0)$
-2
-4
-6
-8
$3x + 4$
(-1,9)
-10
-12
Y'

Date:

(vii) $f(x) = -2x-1$

$g(x) = x^2 - 4x$?

Sol - * For

$$y = -2x-1$$

at $x=0$, $y=-1$

at $y=0$, $x = -1/2$

So, $(0,-1)$ and $(-\frac{1}{2}, 0)$

are y-intercep and x-intercept.

* $y = x^2 - 4x$

at $x=0$, $y=0$ $\Rightarrow$ $\boxed{(0,0)}$

at $y=0$,

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

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

$$\boxed{x=0} \quad , \quad x-4=0$$

$$\boxed{x=4}$$

So, $(0,0)$ and $(4,0)$ are x-intercepts.

Now find vertex. As

$$h = \frac{-b}{2a} = \frac{-(-4)}{2(1)} = 2$$

$$K = f(h) = f(2) = (2)^2 - 4(2)$$

$$= 4 - 8 = -4$$

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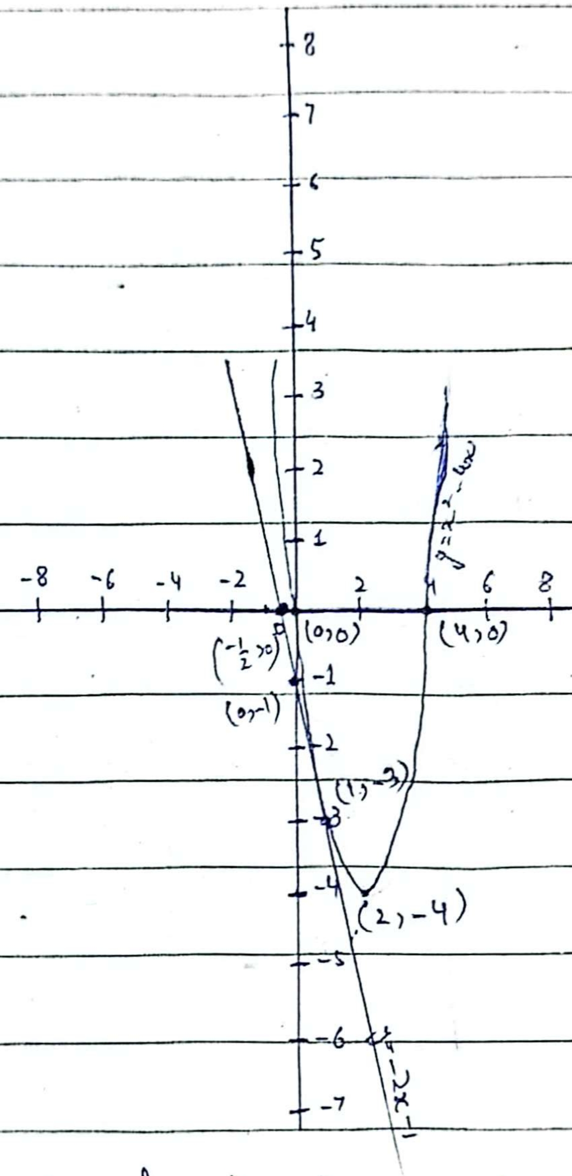
$\Rightarrow$ Vertex $= (h, k) = (2, -4)$.



So, point of intersection is $(1, -3)$.

Date:

(viii) $f(x) = -x^2 - 3x + 2$

$g(x) = x^2 +$ [illegible] ?

Let

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

at $x = 0$, $y = -\cancel{(0)^2}^{\,0} - \cancel{3(0)}^{\,0} + 2$

$$y = 2$$

$$\Rightarrow \boxed{(0, 2)}$$

at $y = 0$,

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

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

$a = 1$, $b = 3$, $c = -2$

By quadratic formula,

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

$$= \frac{-3 \pm \sqrt{9+8}}{2}$$

$$= \frac{-3 \pm \sqrt{17}}{2}$$

$x = \frac{-3 + \sqrt{17}}{2}$, $x = \frac{-3 - \sqrt{17}}{2}$

$x = 0.6$, $x = -3.6$

So, $(0.6, 0)$ and $(-3.6, 0)$ are x-intercepts

To find vertex (h, k).

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$h = \frac{-b}{2a} = \frac{-(3)}{2(1)} = -1.5$

$K = f(h)$

$K = f(-1.5)$

$= -(-1.5)^2 - 3(-1.5) + 2$

$K = 4.25$

So

Vertex $= (-1.5, 4.3)$

* Let

$y = x + 6$

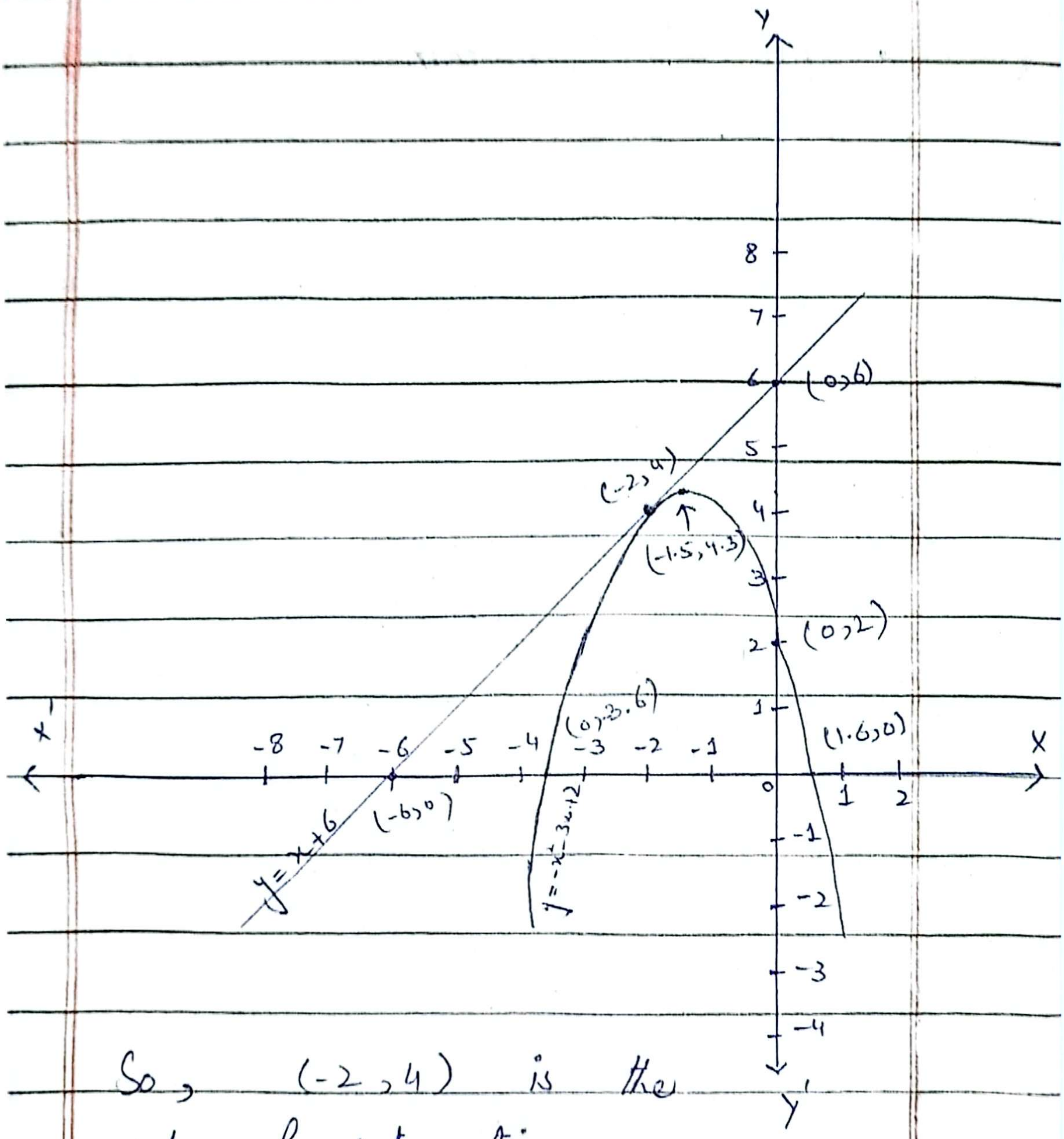
at $x = 0$, $y = 6$

at $y = 0$, $x - 6$

So, $(-6, 0)$ and $(0, 6)$

are x-intercept & y-intercept.

Date:



So, $(-2, 4)$ is the point of intersection.

Date:

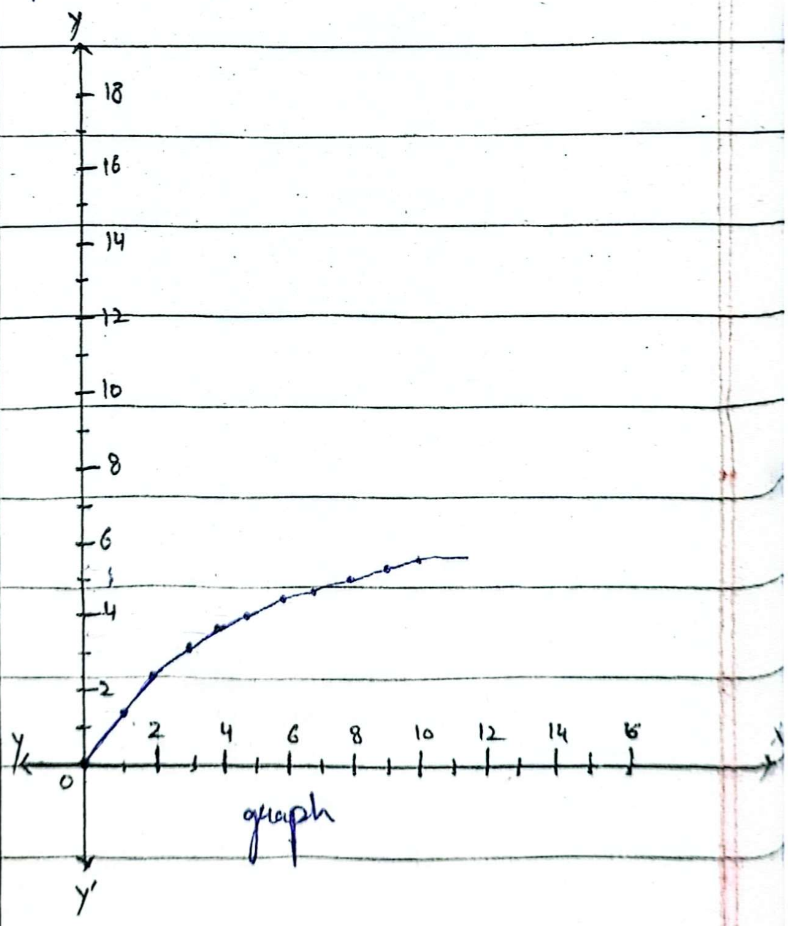
Q3_ Graph the following Junctions:

(i) $y = \sqrt{3x}$?

Clearly domain of $y = \sqrt{3x}$ is $x \geq 0$ because square-root of negative number is not real. And range is $y \geq 0$.

Now graph is given below:

x	y
0	0
1	1.7
2	2.4
3	3
4	3.5
5	3.9
6	4.2
7	4.6
8	4.9
9	5.2
10	5.5



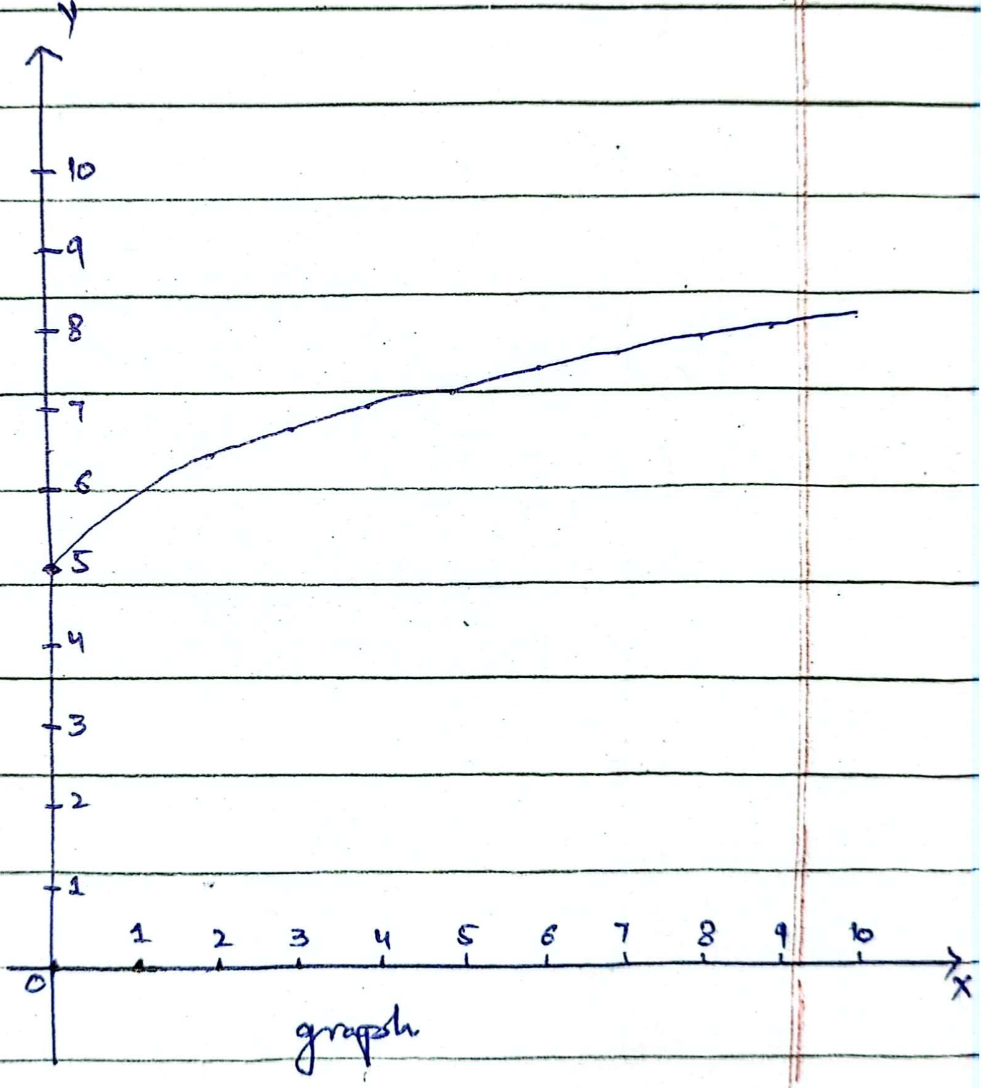
graph

Date:

(ii) $y = \sqrt{x} + 5$

Domain of $y = \sqrt{x} + 5$ is $x \geq 0$ because square root of negative number is not real. And ~~dom~~ range is $y \geq 5$.

x	y
0	5
1	6
2	6.4
3	6.7
4	7
5	7.2
6	7.4
7	7.6
8	7.8
9	8
10	8.1



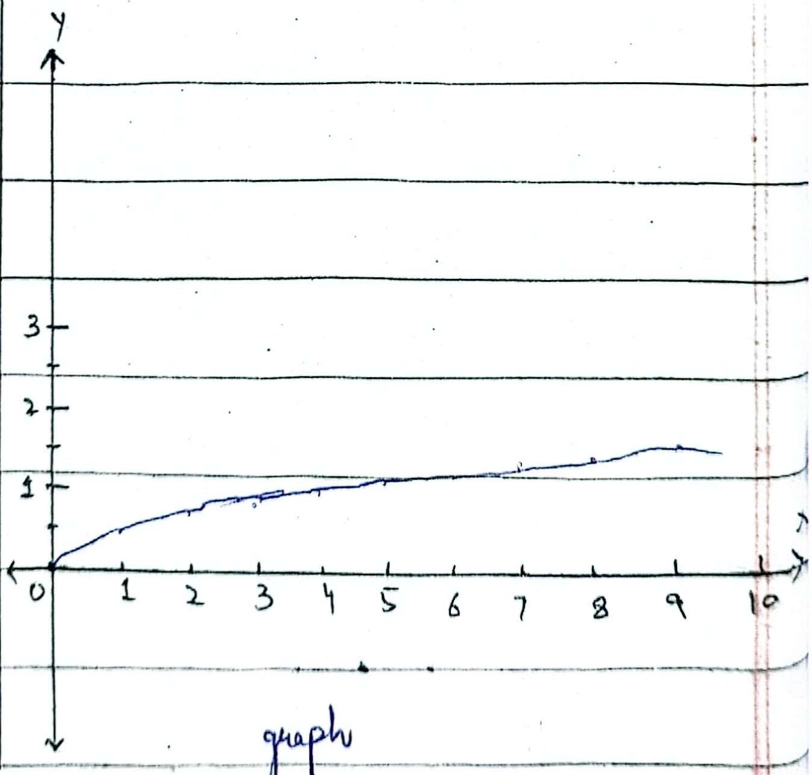
graph

Date:

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

Domain of $y = \frac{\sqrt{x}}{2}$ is $x \geq 0$ because '$\sqrt{\ }$' of negative number isn't real number. And range $y \geq 0$. So,

x	y
0	0
1	0.5
2	0.7
3	0.8
4	1
5	1.1
6	1.2
7	1.3
8	1.4
9	1.5
10	1.6



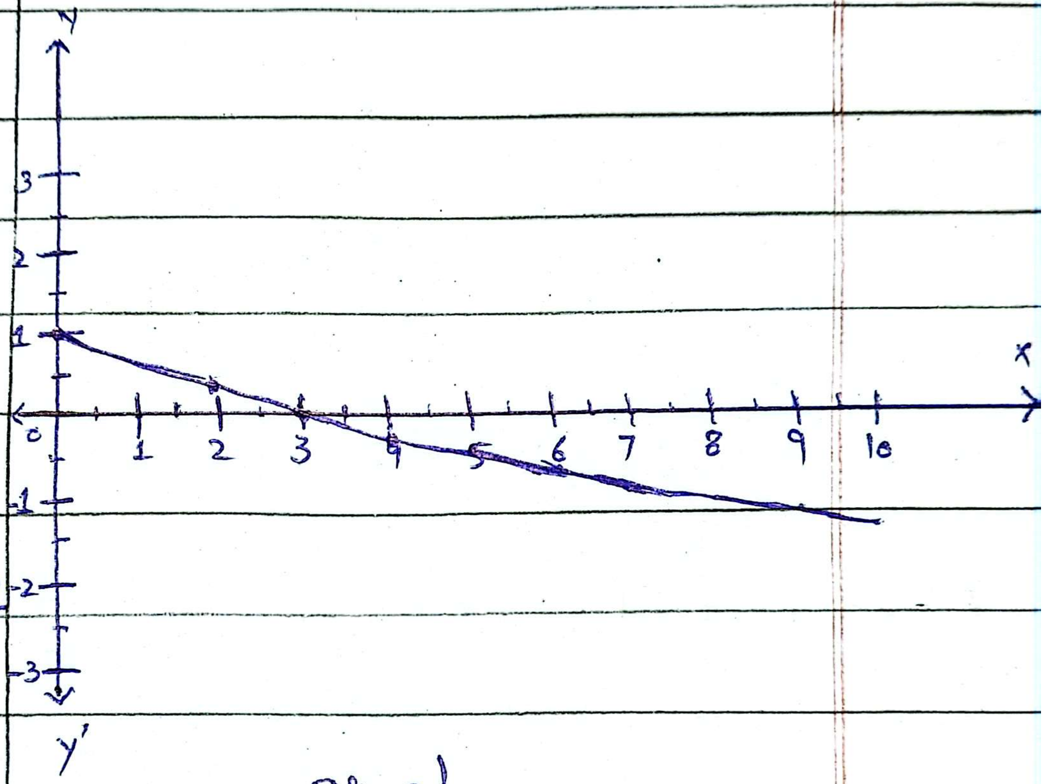
graph

Date:

(iv) $y = -\sqrt{x+1} + 2$

Clearly domain of $y = -\sqrt{x+1} + 2$ is $x \geq -1$. And range $y \leq 2$

x	y
-1	2
0	1
1	0.6
2	0.3
3	0
4	-0.2
5	-0.4
6	-0.6
7	-0.8
8	-1
9	-1.1
10	-1.3



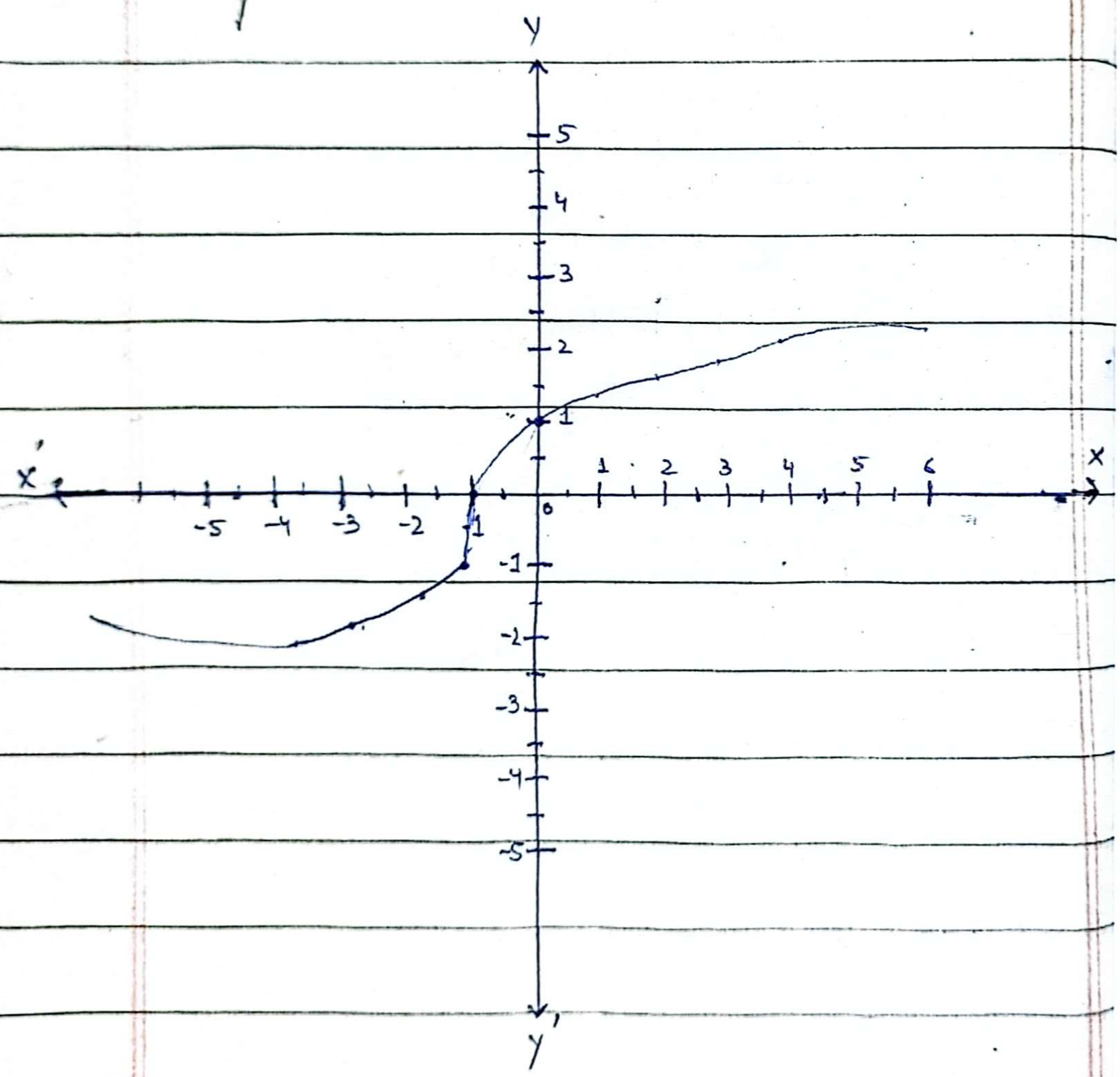
graph

Date: ________

(v) $y = \sqrt[3]{2x+1}$

x	-4	-3	-2	-1	0	1	2	3	4
y	-1.9	-1.7	-1.4	-1	1	1.4	1.7	1.9	2.1

Graph:



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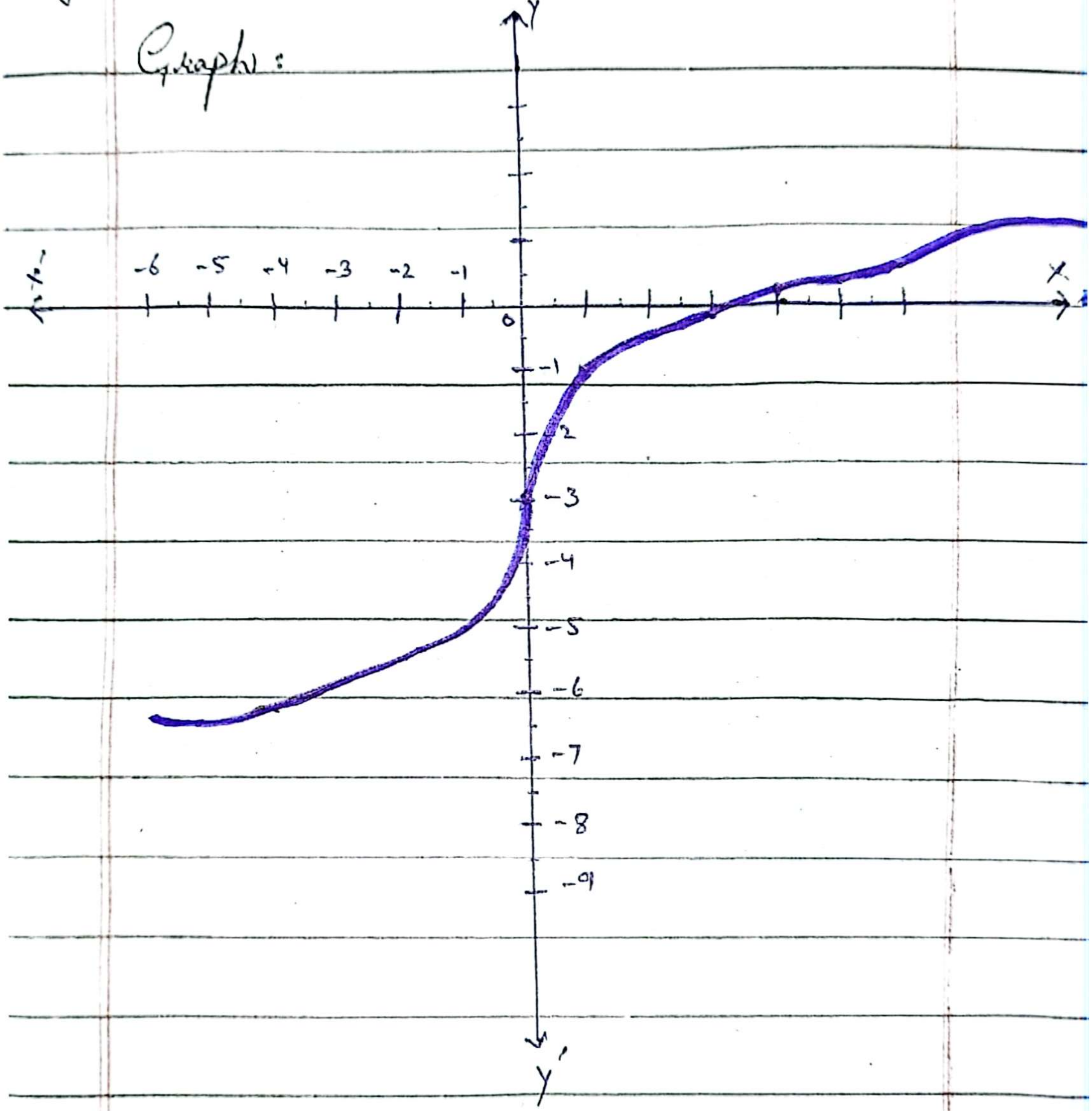
(vi) $y = 2\sqrt[3]{x} - 3$

x	-4	-3	-2	-1	0	1	2	3	4	5	6
y	-6.2	-5.8	-5.5	-5	-3	-1	-0.5	-0.1	0.1	0.4	0.6

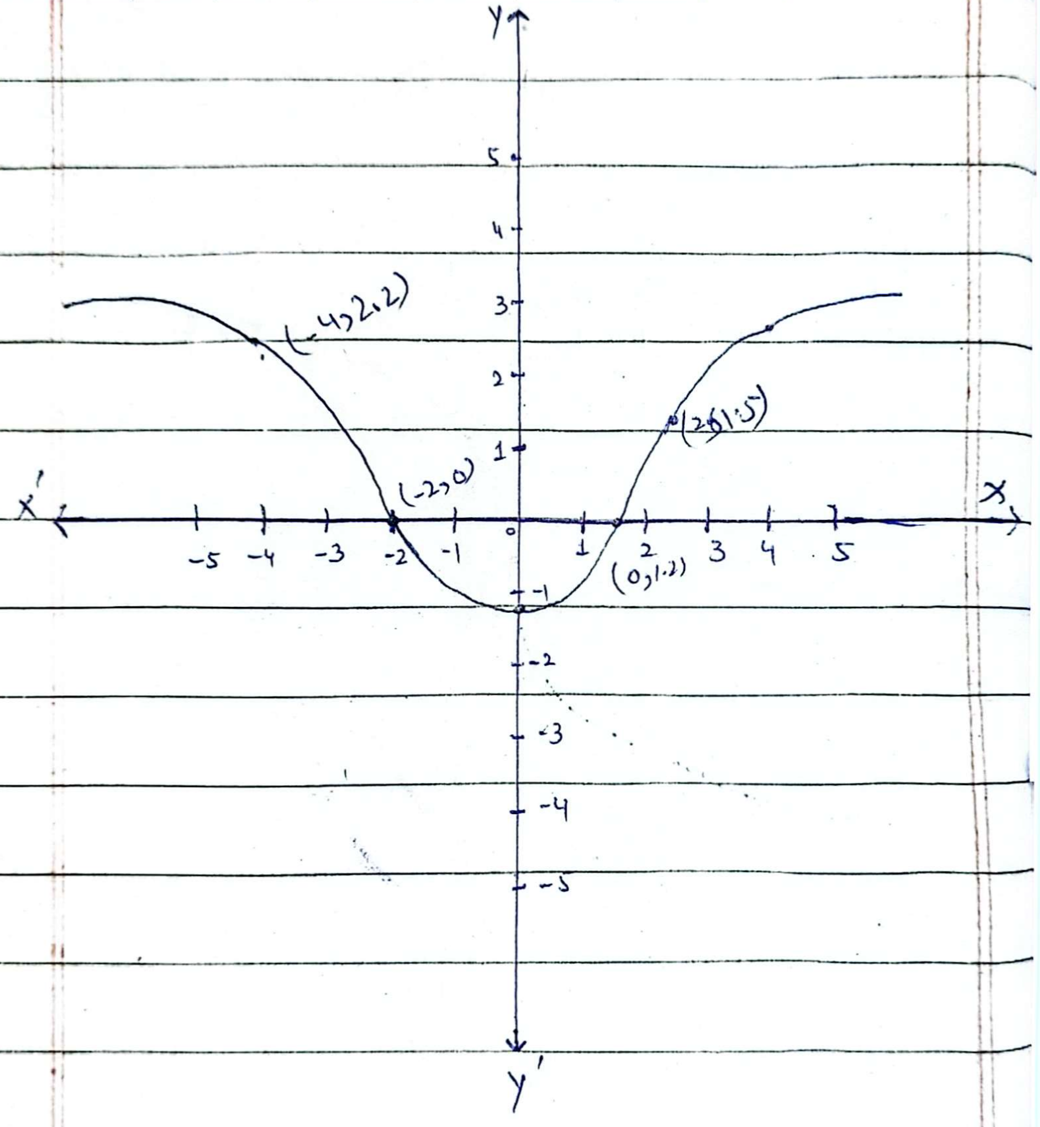
Graph:



Date:

(viii) $y = \sqrt[3]{x^2+x-2}$

x	-8	-6	-4	-2	0	2	4	6	8	10
y	3.7	3.1	2.2	0	-1.2	1.5	2.6	3.4	4.1	4.8



Date:

Q4. A buildings height modeled by $H(t) = 100 + 20t$ (m) and t is time. The height of near by growing tree is:

$$T(t) = 50 + 10t + t^2$$

(i) At what time building and tree have same height.

(ii) What will be the height.

Sketch graph & when tree will overtake the building?

Sol. (i): To prove at what time tree and building have same height.

Let

Height of tree = Height of building

$$T(t) = H(t)$$

$$50 + 10t + t^2 = 100 + 20t$$

$$t^2 + 10t + 500 - 20t - 100 = 0$$

$$t^2 - 10t - 50 = 0$$

By using quadratic formula:

$$a = 1 \quad , \quad b = -10 \quad , \quad c = -50$$

$$t = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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$$= \frac{10 \pm \sqrt{(-10)^2 - 4(1)(-50)}}{2}$$

$$= \frac{10 \pm \sqrt{100 + 200}}{2}$$

$$= \frac{10 \pm \sqrt{300}}{2}$$

$$t = \frac{10 \pm 17.3}{2}$$

$$t = \frac{10 + 17.3}{2} \quad , \quad t = \frac{10 - 17.3}{2}$$

$$= \frac{27.3}{2} \quad , \quad t = \frac{-7.3}{2}$$

$t = 13.7 \approx 14$, Neglect being negative

$$\boxed{t = 13.7 \text{ month}}$$ Ans

(ii) **$H(13.7) = ?$**

$$H(t) = 100 + 20t$$

$$H(13.7) = 100 + 20(13.7)$$

$$= 374 \text{ m}.$$

Date:

Q5 A radio-active substance have half life of 2 years. If initial quantity is 200g and

$$Q(t) = Q_0\left(\frac{1}{2}\right)^{t/h}$$

Find remaining quantity after 6 years?

Sol- Given data:

h = half life = 2 years

Q_0 = Initial quantity = 200 g

$Q(6) = ?$

As given,

$$Q(t) = Q_0\left(\frac{1}{2}\right)^{t/h}$$

By putting values,

$$Q(6) = 200\left(\frac{1}{2}\right)^{6/2}$$

$$= 200\left(\frac{1}{2}\right)^{3}$$

$$= 200 \times \frac{1}{8}$$

$$= 25 \text{ g}$$

Ans.