

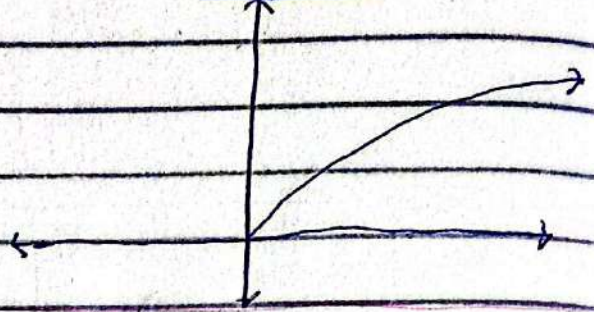
Exc 1.5

Some Important Function and their Graph.

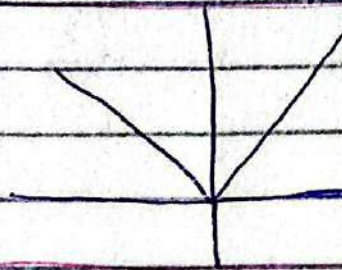
Function

Graph

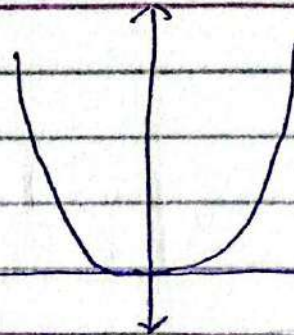
$$y = \sqrt{x}$$



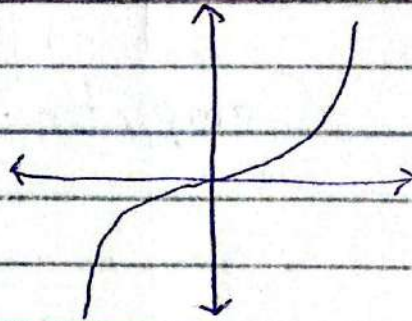
$$y = |x|$$



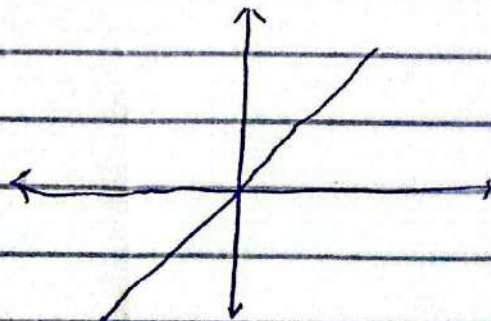
$$y = x^2$$



$$y = x^3$$



$$y = x$$



Rules

i) Horizontal Shift

• If change in x occurs $+ve$ or $-ve$, it leads to horizontal translation.

• Graph moves Left or Right

$$y = f(x+c)$$

IF $c > 0$ move Left

IF $c < 0$ move right

ii) Vertical Shift

• If change in Function occurs then it leads to vertical shift / translation.

• Graph moves up and down.

$$y = f(x) + c$$

IF $c < 0$ move down

IF $c > 0$ move up

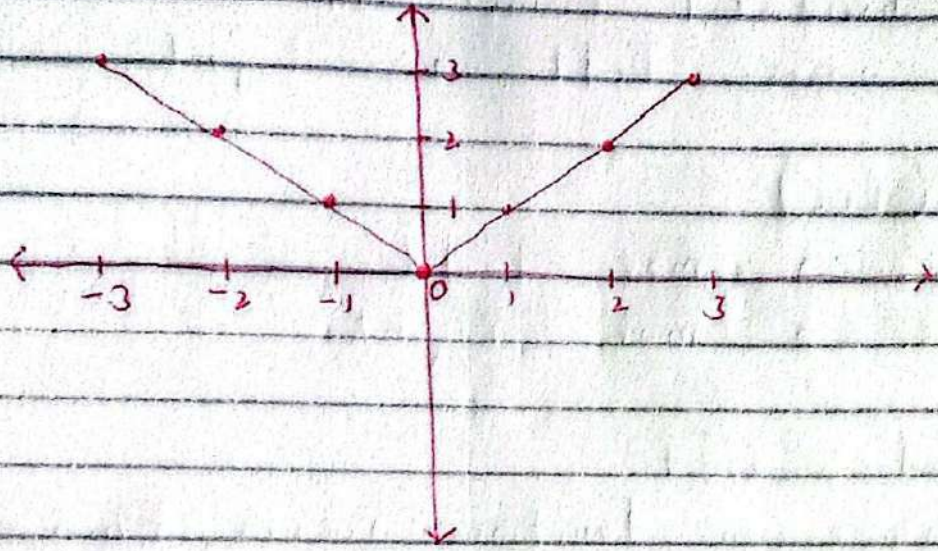
Above Rules will be Applied to these Questions:

Q# 1, 2, 3, 5, 6

Q #1 $y = |x|$

SOL

x	-3	-2	-1	0	1	2	3
y	3	2	1	0	1	2	3

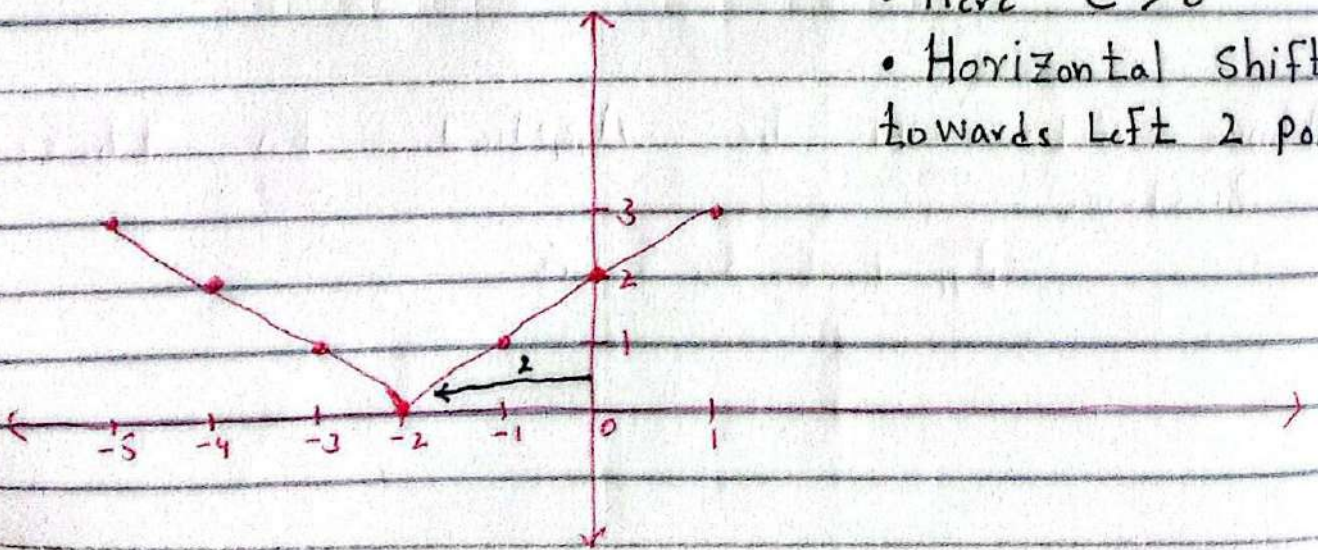


(a) $y = |x + 2|$

Put $x + 2 = 0 \Rightarrow x = -2$

x	-5	-4	-3	-2	-1	0	1
y	3	2	1	0	1	2	3

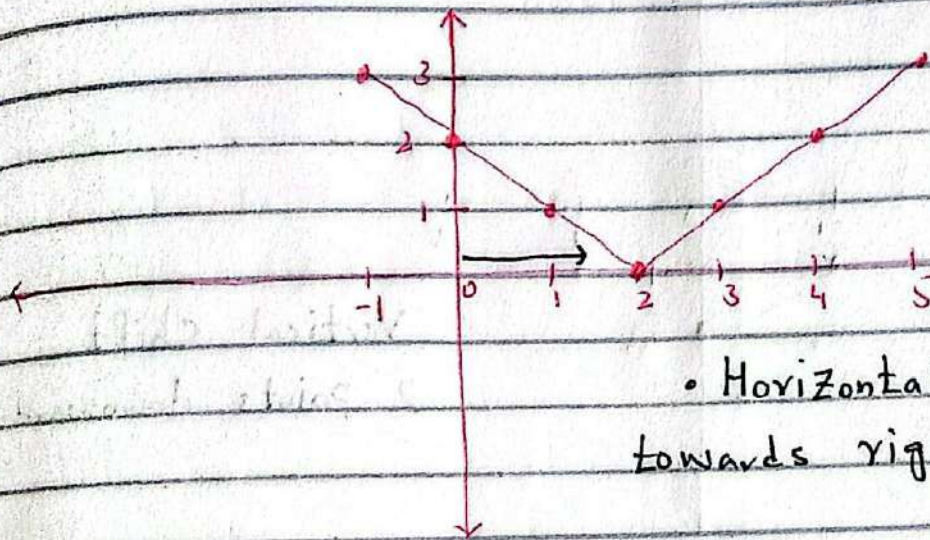
- Here $c > 0$
- Horizontal shift towards left 2 points



b) $y = |x - 2|$

Put $x - 2 = 0$ $x = 2$

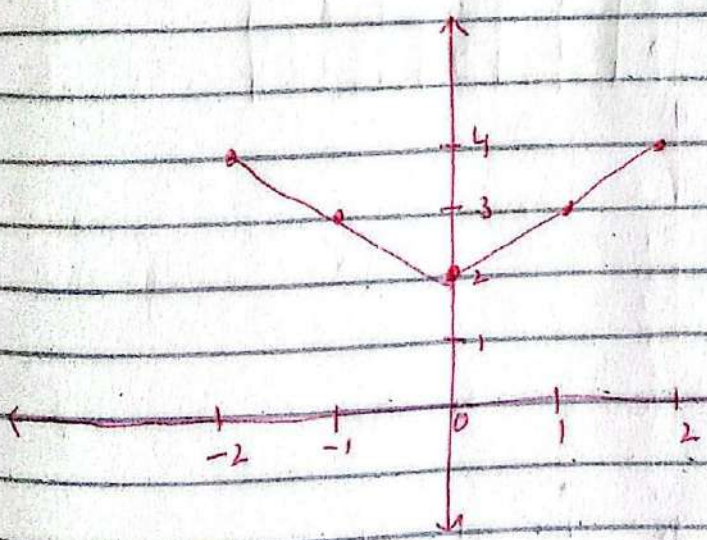
x	-1	0	1	2	3	4	5
y	3	2	1	0	1	2	3



- Here $c < 0$
- Horizontal shift towards right 2 points.

(c) $y = |x| + 2$

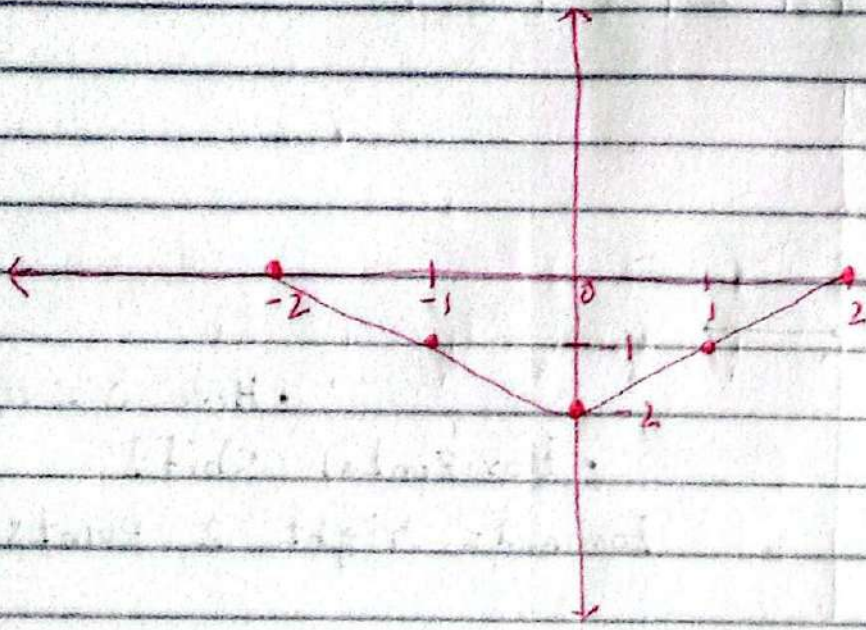
x	-2	-1	0	1	2
y	4	3	2	3	4



- Vertical shift upward 2 point

d) $y = |x| - 2$

x	-2	-1	0	1	2
y	0	-1	-2	-1	0

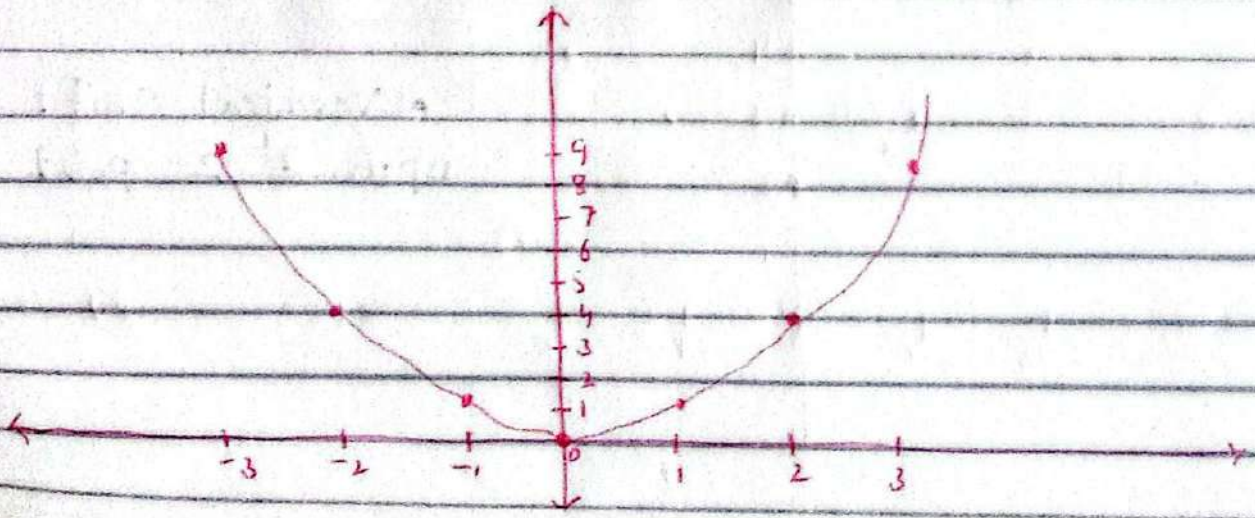


Vertical shift
2 points downward.

Q #2
Sol

$y = x^2$

x	-3	-2	-1	0	1	2	3
y	9	4	1	0	1	4	9

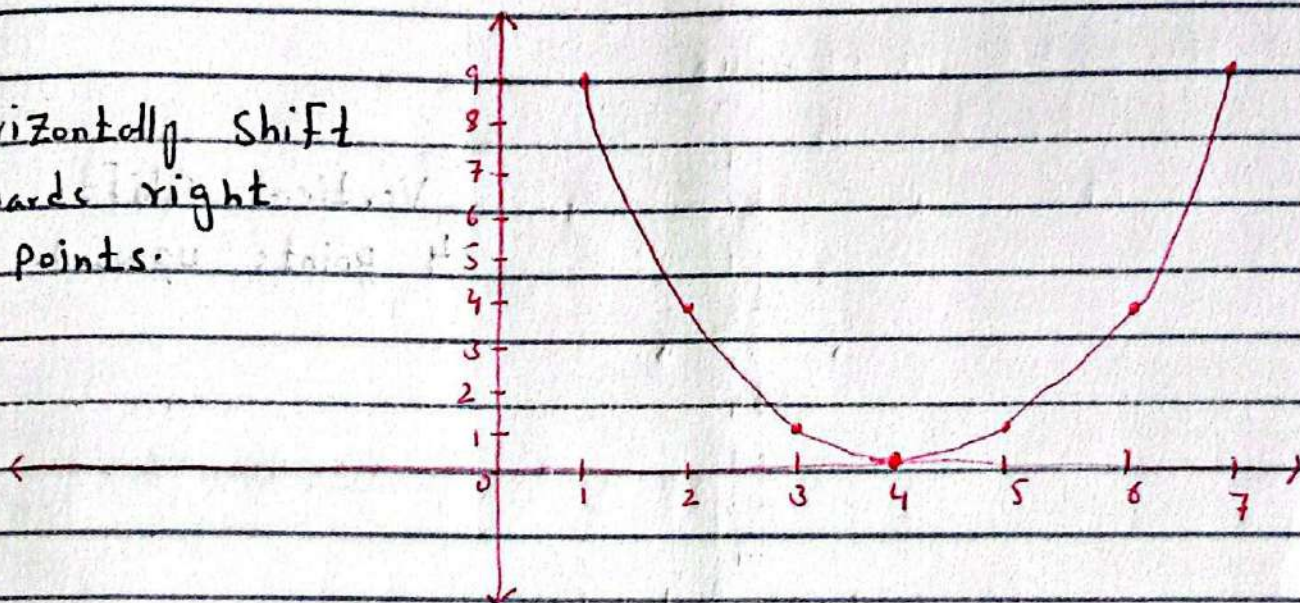


(c) $y = (x - 4)^2$

Put $x - 4 = 0$ $x = 4$

x	+1	+2	+3	4	5	6	7
y	9	4	1	0	1	4	9

Horizontally shift
towards right
4 points.

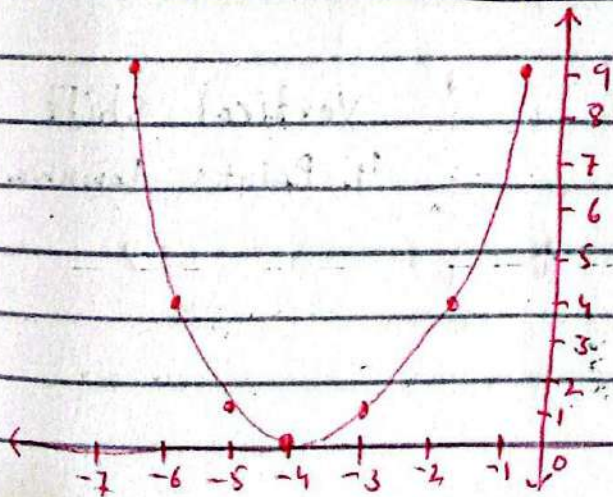


(d) $y = (x + 4)^2$

Put $x + 4 = 0$ $x = -4$

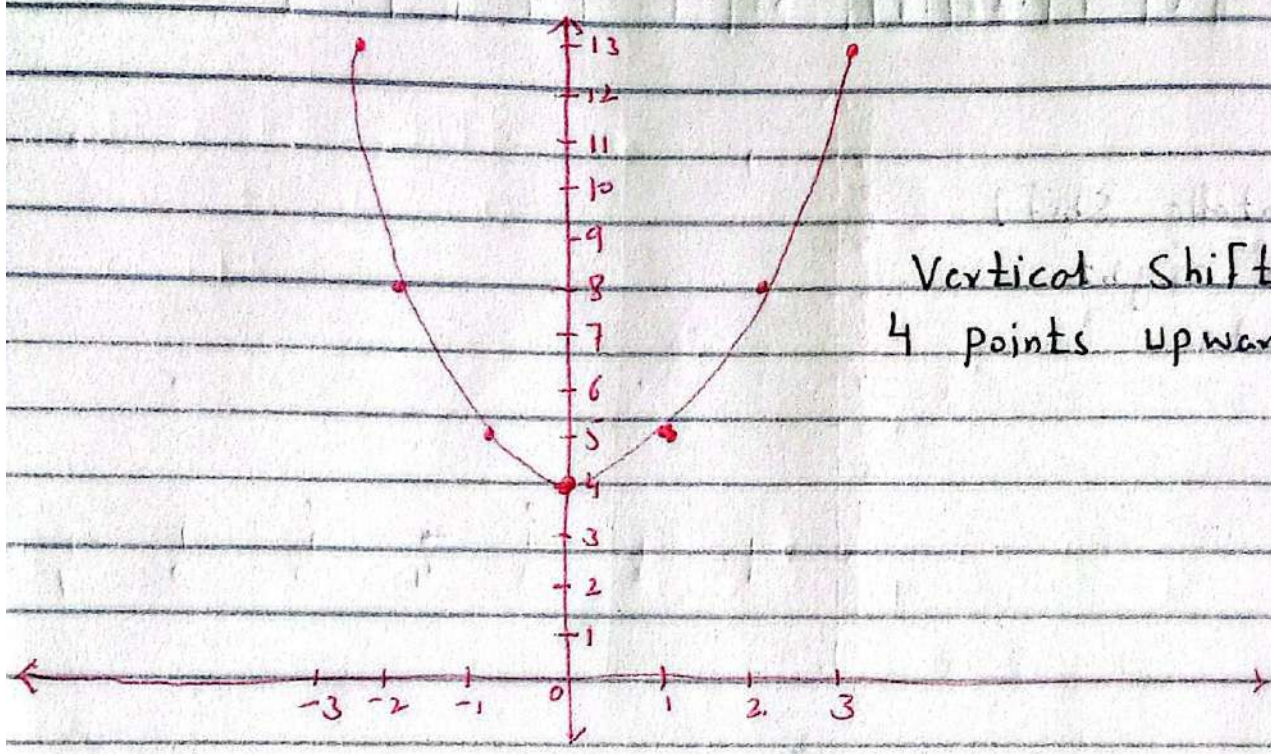
x	-7	-6	-5	-4	-3	-2	-1
y	9	4	1	0	1	4	9

Horizontally shift
towards left 4 points



(a) $y = x^2 + 4$

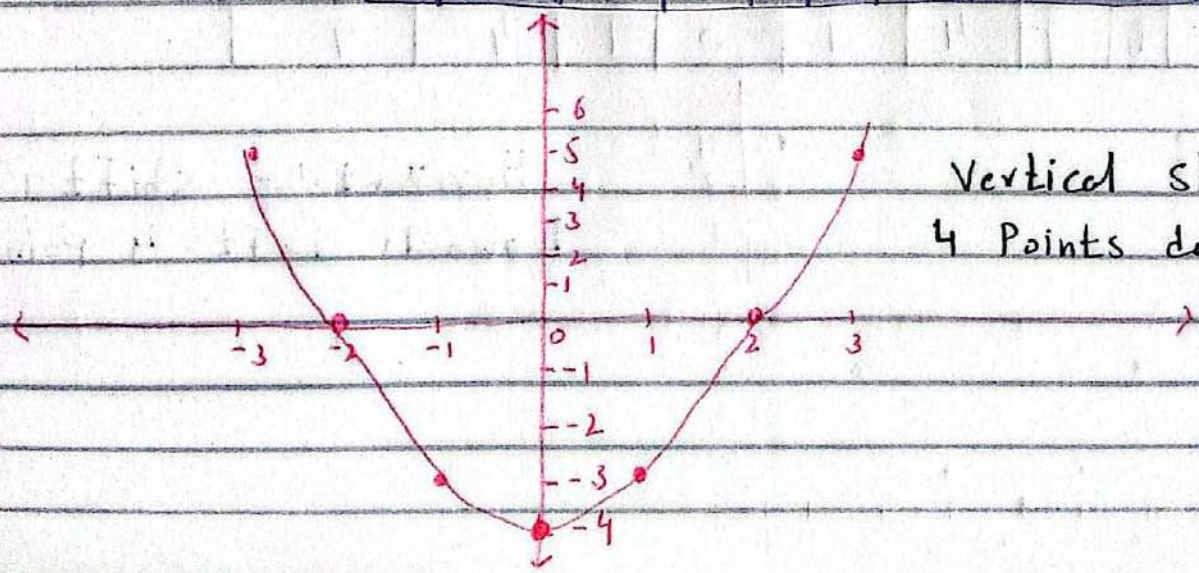
x	-3	-2	-1	0	1	2	3
y	13	8	5	4	5	8	13



Vertical Shift
4 points upward.

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

x	-3	-2	-1	0	1	2	3
y	5	0	-3	-4	-3	0	5



Vertical Shift
4 Points downward.

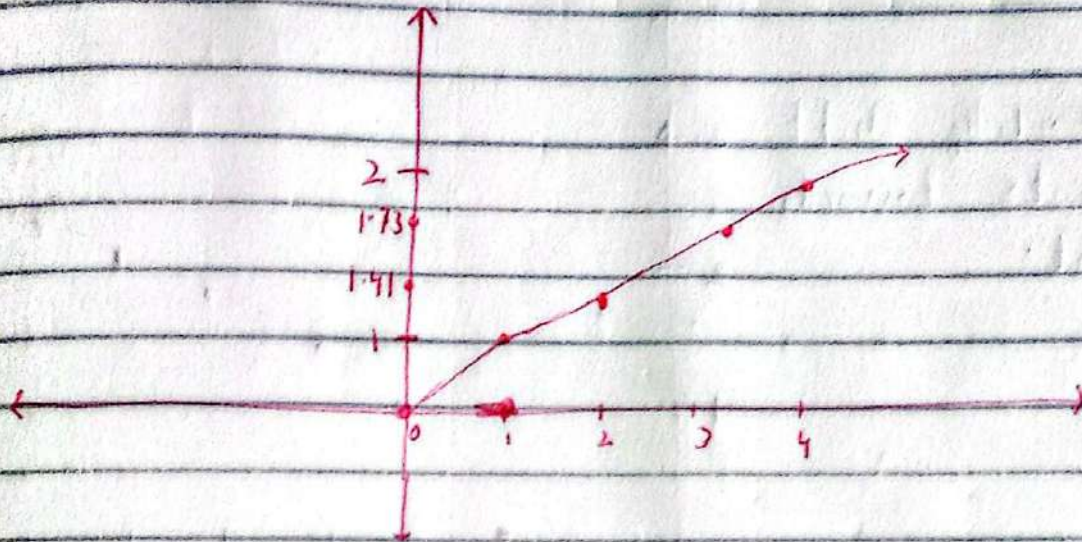
Q #3

$y = \sqrt{x}$

$x \geq 0$

Sol

x	0	1	2	3	4
y	0	1	1.41	1.73	2



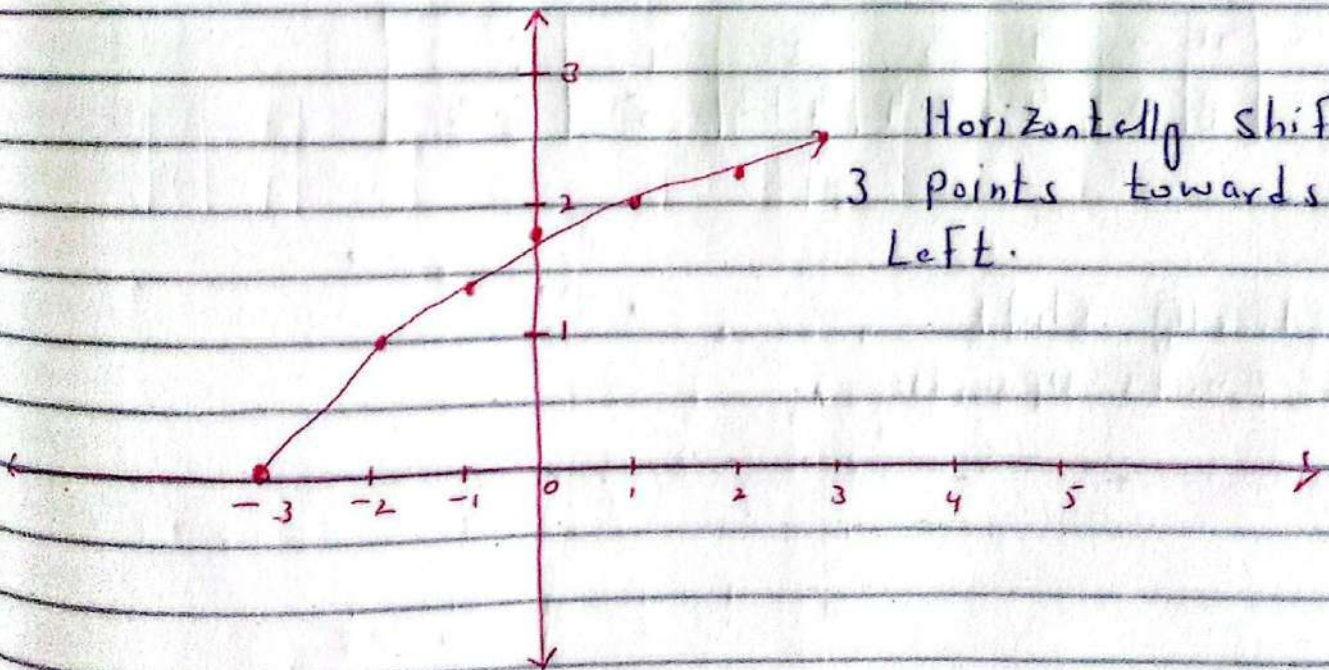
(a)

$y = \sqrt{x+3}$

Put $x+3 \geq 0$

$x \geq -3$

x	3	2	-3	-2	-1	0	1
y	2.45	2.24	0	1	1.41	1.73	2



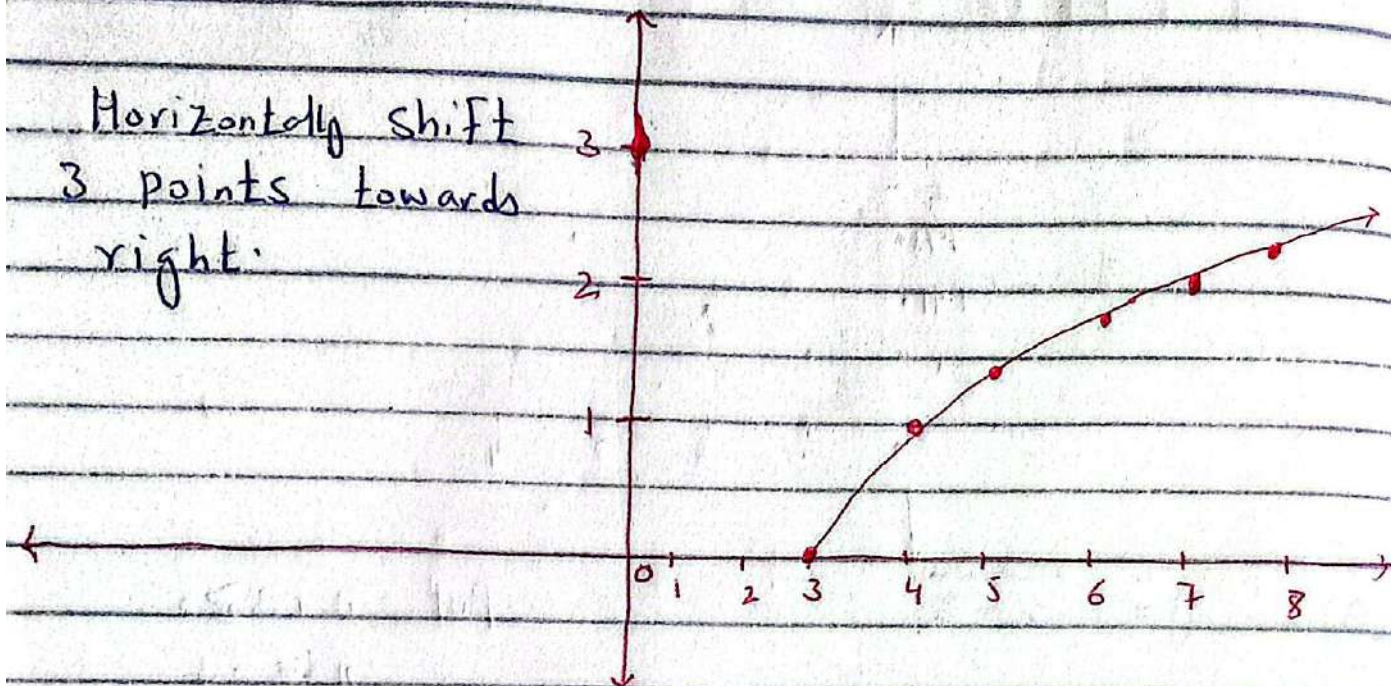
Horizontally shift 3 points towards Left.

b) $y = \sqrt{x-3}$

Put $x-3 \geq 0$
 $x \geq 3$

x	3	4	5	6	7	8
y	0	1	1.41	1.73	2	2.2

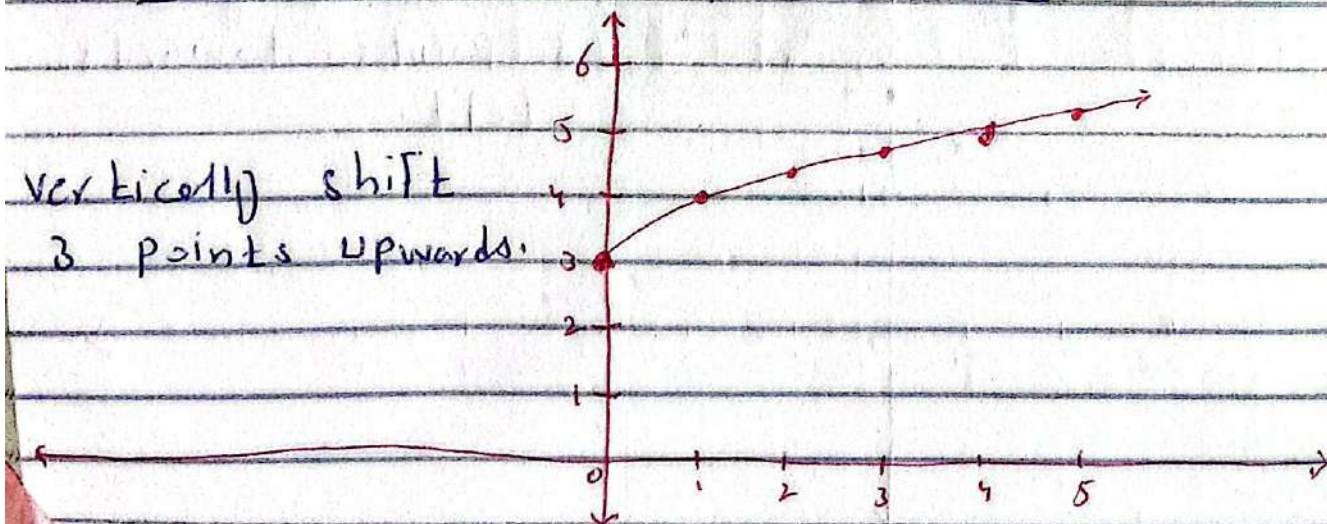
Horizontally shift
3 points towards
right.



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

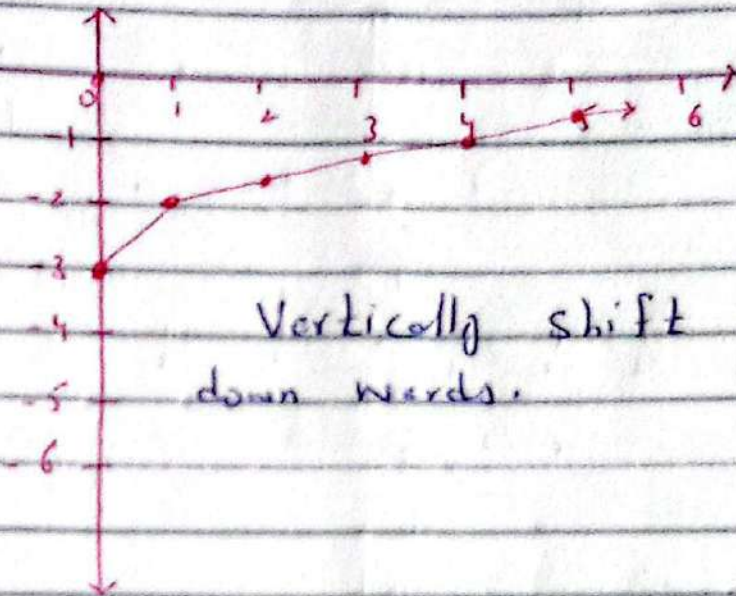
x	0	1	2	3	4	5
y	3	4	4.4	4.73	5	5.2

Vertically shift
3 points upwards.



d) $y = \sqrt{x} - 3$

x	0	1	2	3	4	5
y	-3	-2	-1.58	-1.26	-1	-0.76

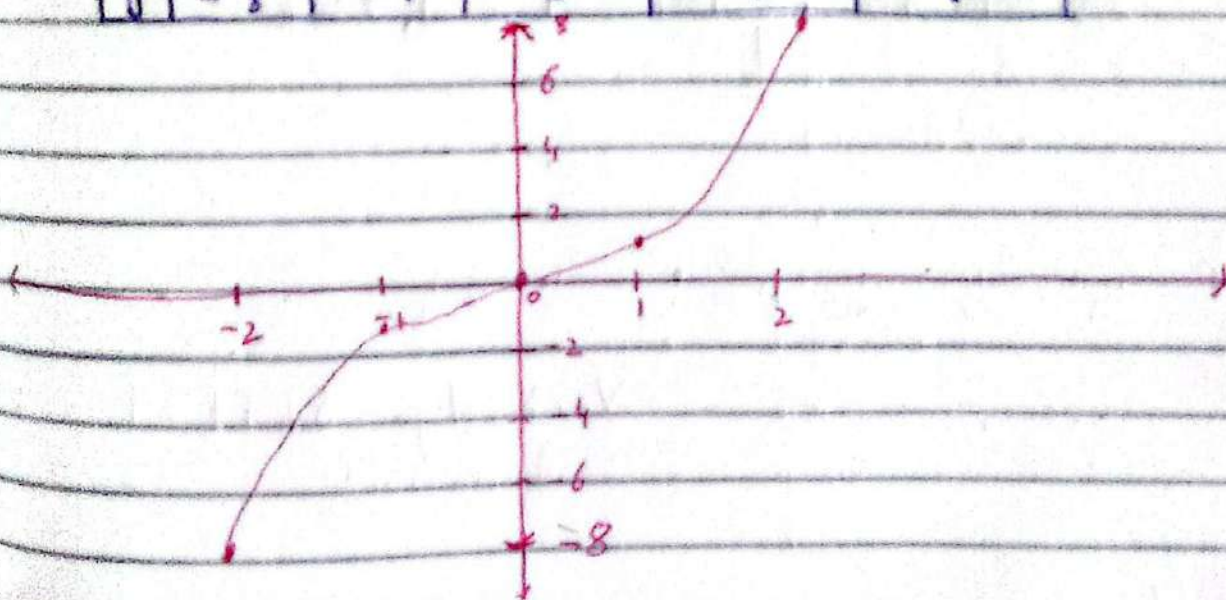


Vertically shift 3 points down wards.

Q#5

$y = x^3$

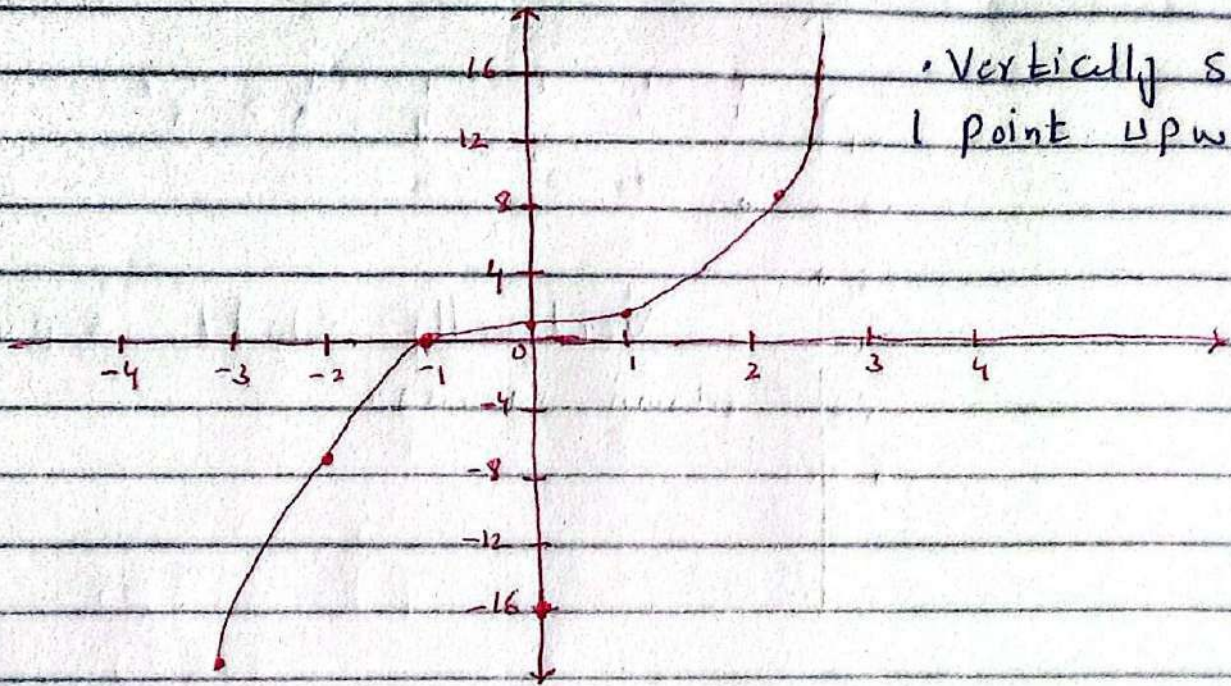
x	-2	-1	0	1	2
y	-8	-1	0	1	8



a)

$$y = x^3 + 1$$

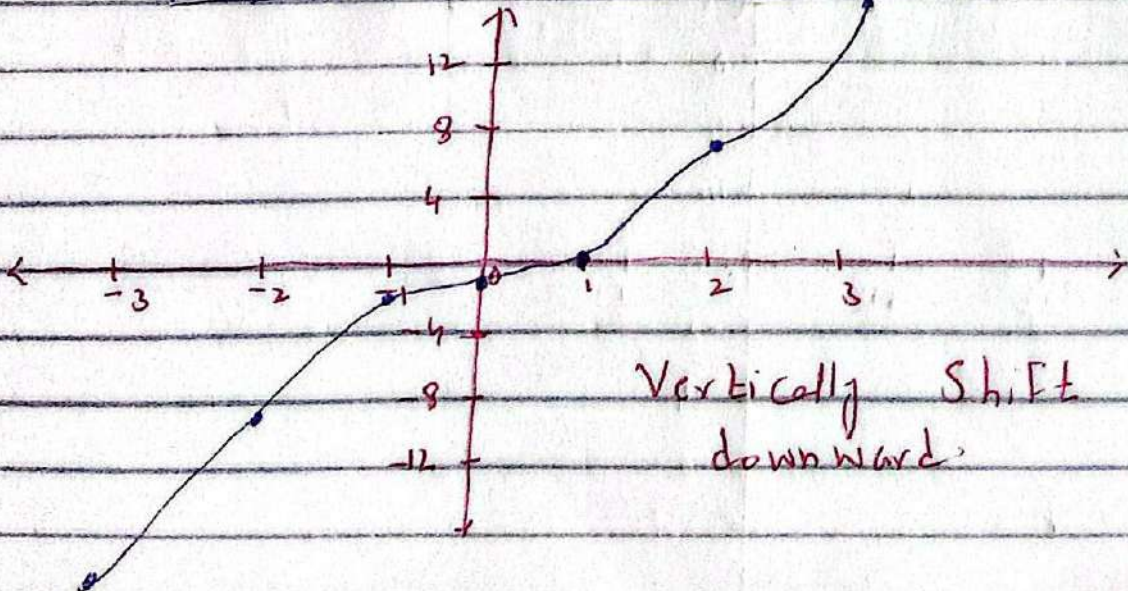
x	-3	-2	-1	0	1	2	3
y	-26	-7	0	1	2	9	28



b)

$$y = x^3 - 1$$

x	-3	-2	-1	0	1	2	3
y	-28	-9	-2	-1	0	7	26

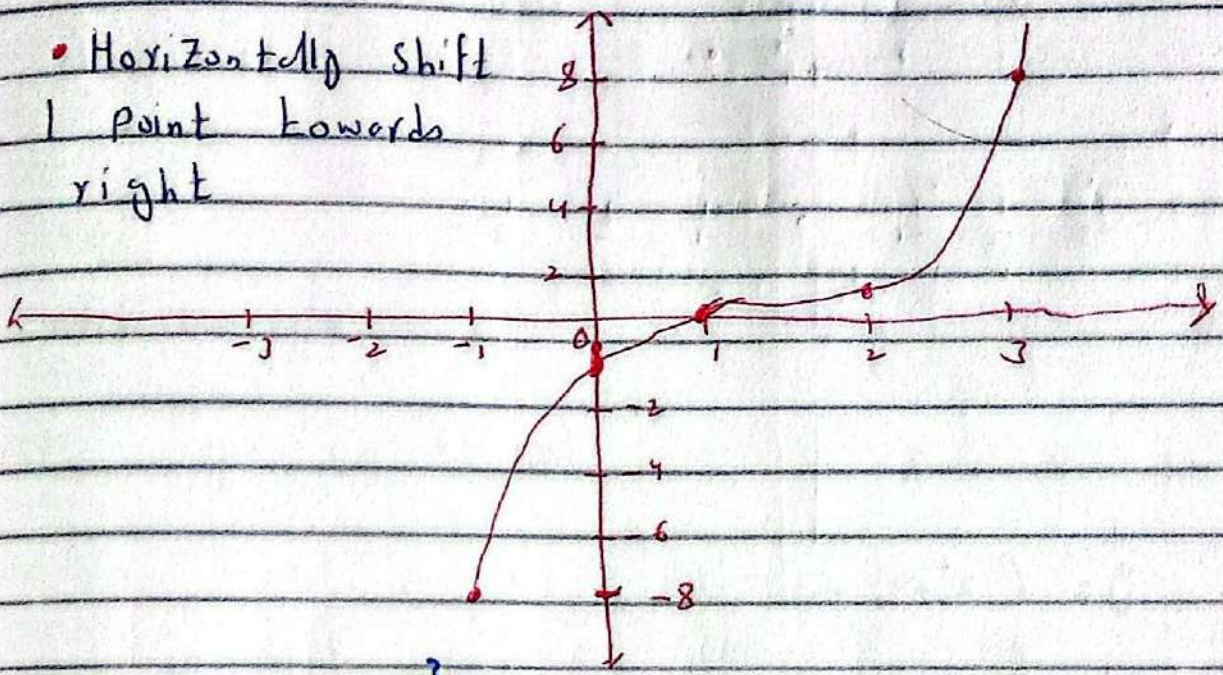


c) $y = (x-1)^3$

Put $x-1 = 0$
 $x = 1$

x	-3	-2	-1	0	1	2	3
y	-64	-27	-8	-1	0	1	8

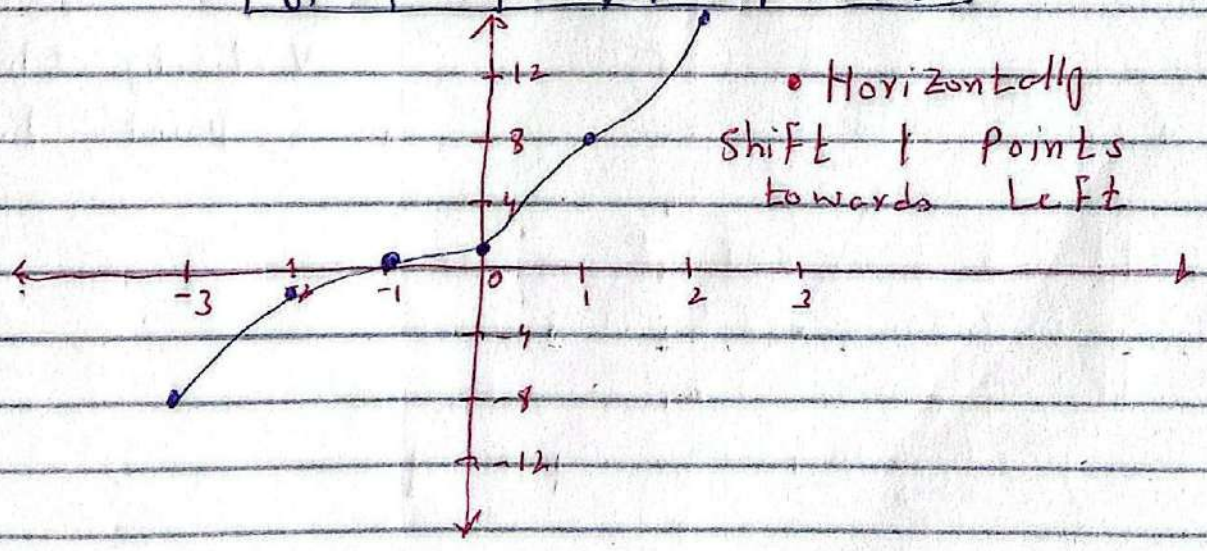
• Horizontally shift
1 point towards
right



d) $y = (x+1)^3$

x	-3	-2	-1	0	1	2	3
y	-8	-1	0	1	8	27	64

• Horizontally
shift 1 points
towards left

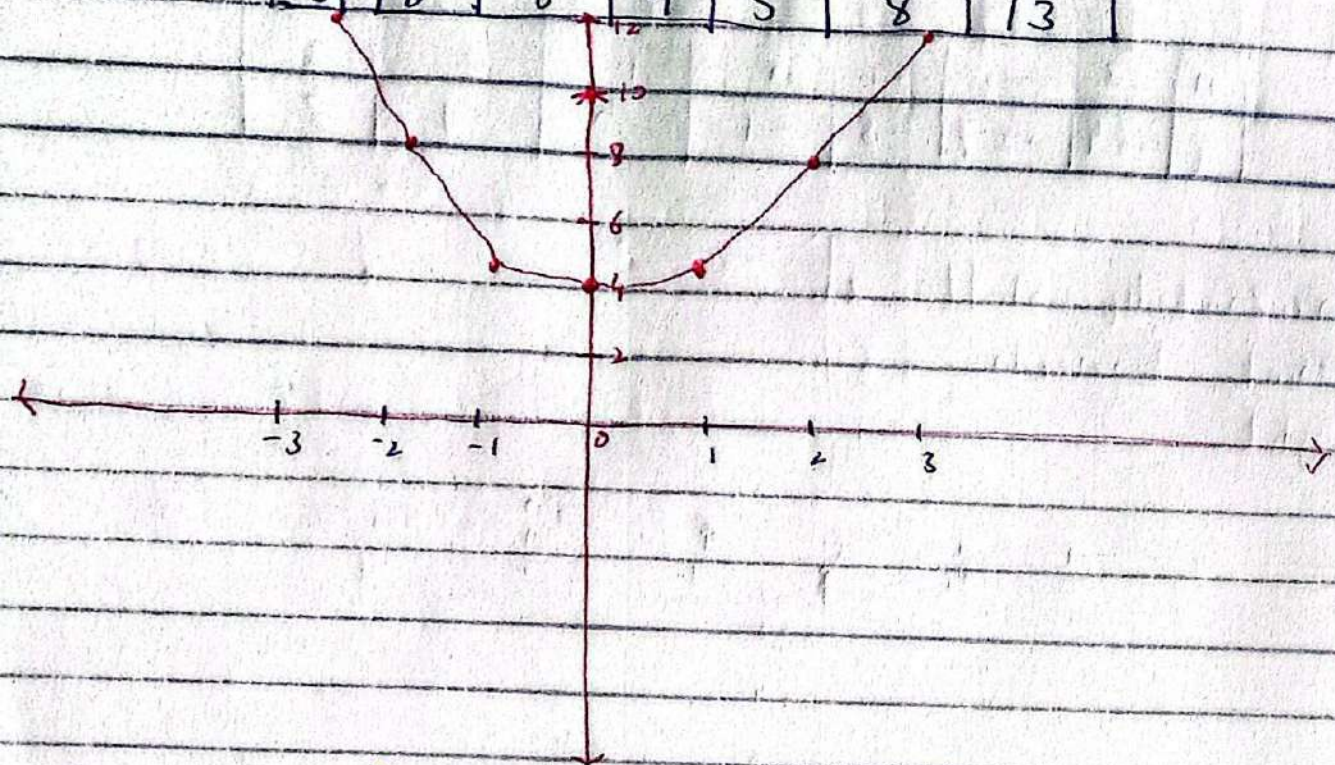


Imp

Q #6: $y = x^2 + 4$

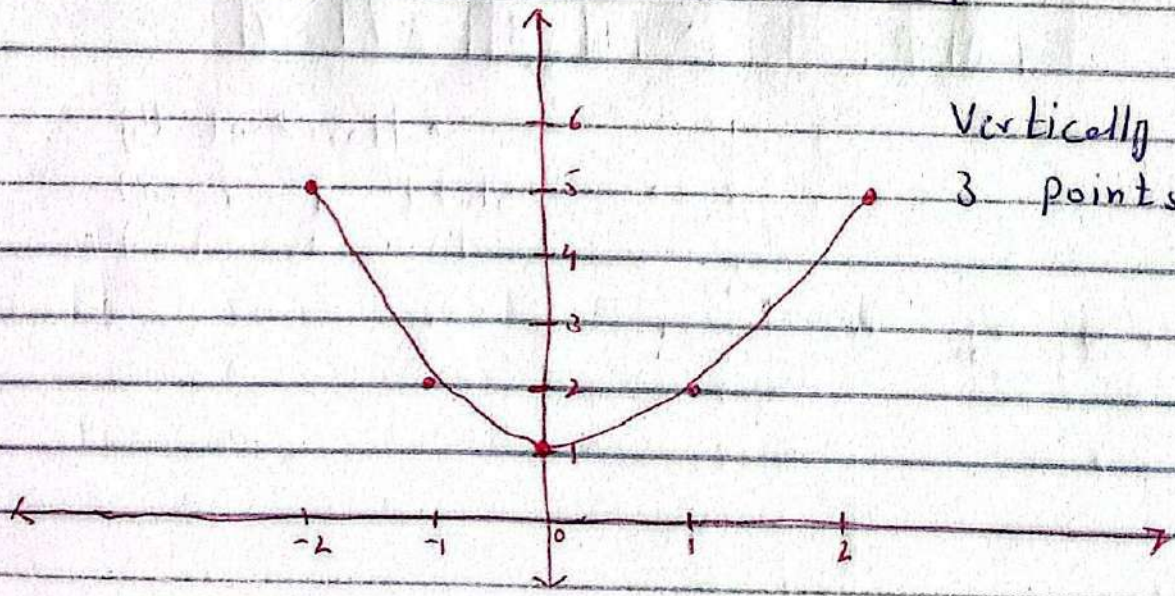
Sol

x	-2	-1	0	1	2	3
y	8	5	4	5	8	13



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

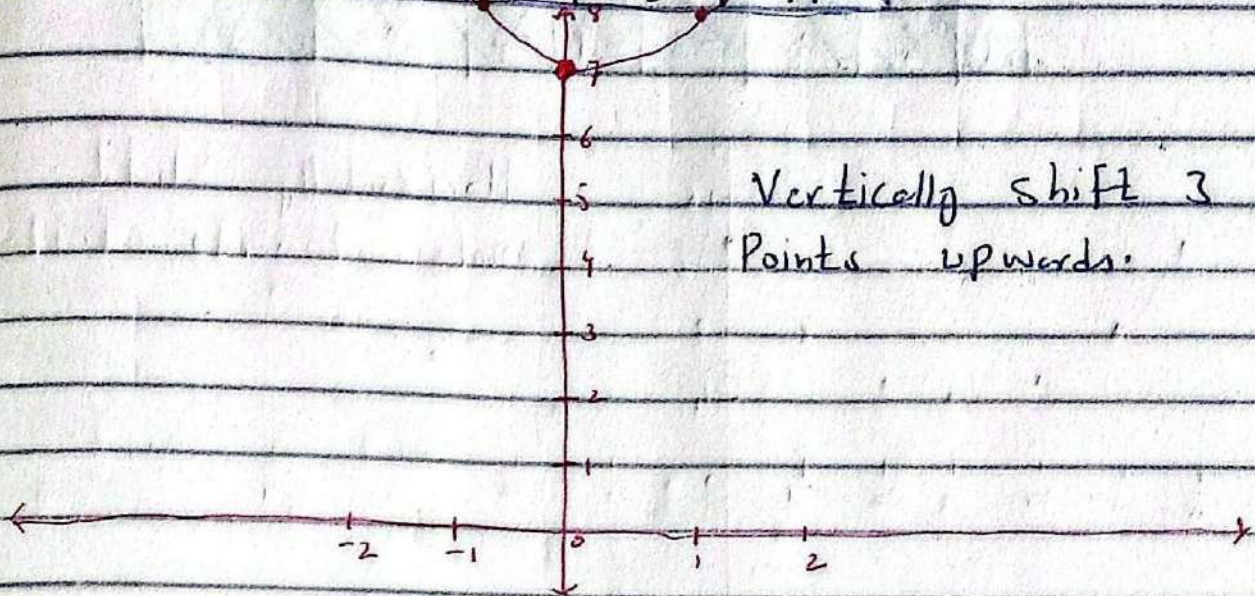
x	-2	-1	0	1	2
y	5	2	1	2	5



Vertically shift
3 points downward

b) $y = (x^2 + 4) + 3$

x	-2	-1	0	1	2
y	11	8	7	8	11

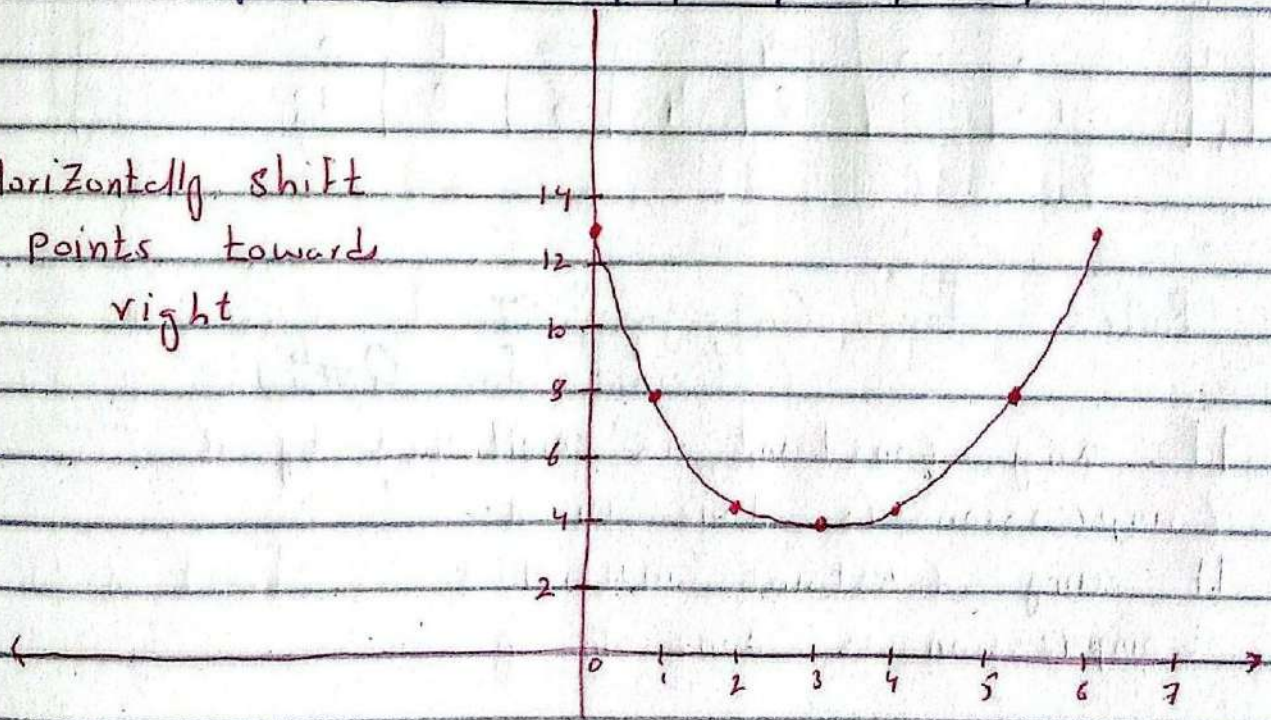


Vertically shift 3
Points upwards.

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

Put $x - 3 = 0$ $x = 3$							
x	0	1	2	3	4	5	6
y	13	8	5	4	5	8	13

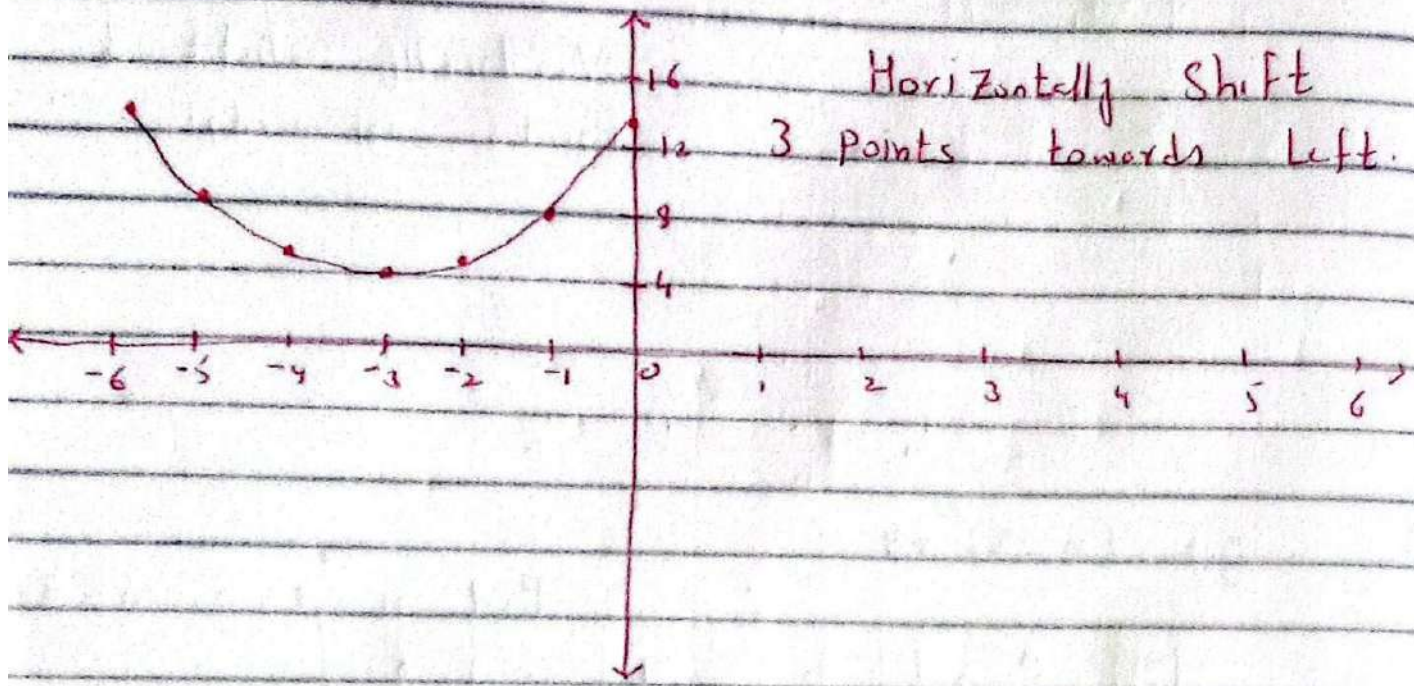
Horizontally shift
3 points towards
right



d) $y = (x+3)^2 + 4$

Put $x+3=0$ $x=-3$

-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6
13	8	5	4	5	8	13						



x	-6	-5	-4	-3	-2	-1	0
y	13	8	5	4	5	8	13

Rules for Category II (only for Q#4)

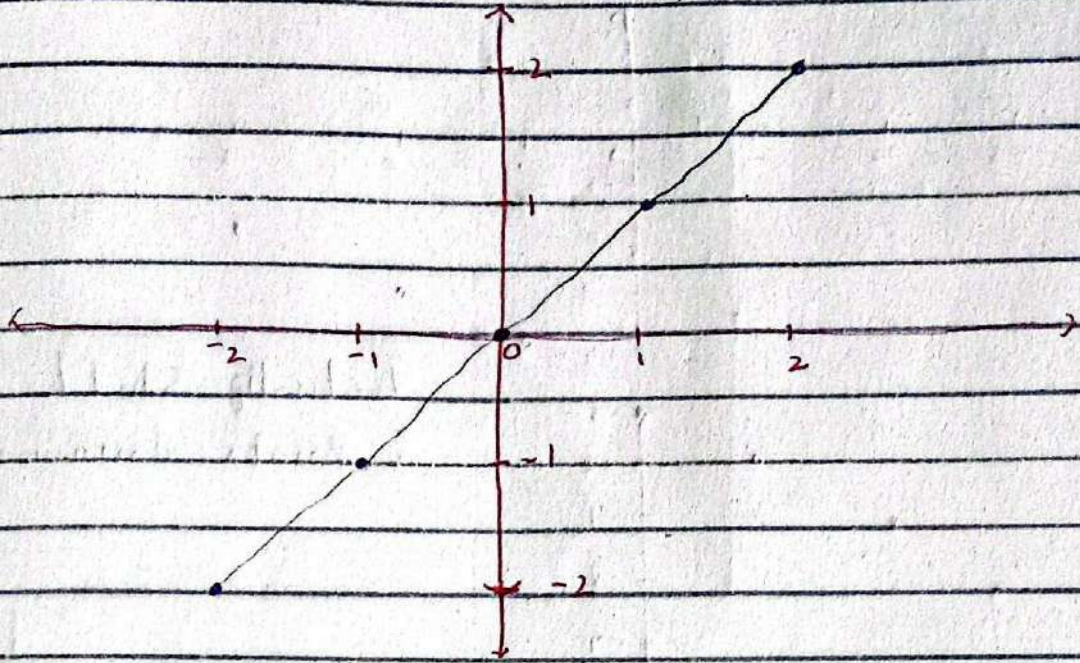
- IF any constant is multiplied by x. Compression is done in x.
- IF any constant multiplied by Function then Compression is done in y.

Q#4

y = x

Sol

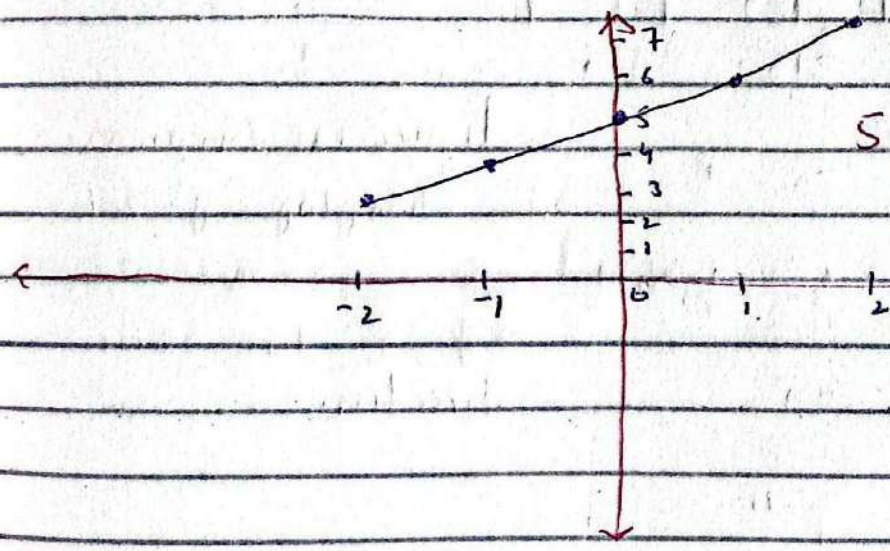
x	-2	-1	0	1	2
y	-2	-1	0	1	2



a) y = x + 5

Function سے کوئی number add کر کے
vertically upwards کر کے

x	-2	-1	0	1	2
y	3	4	5	6	7



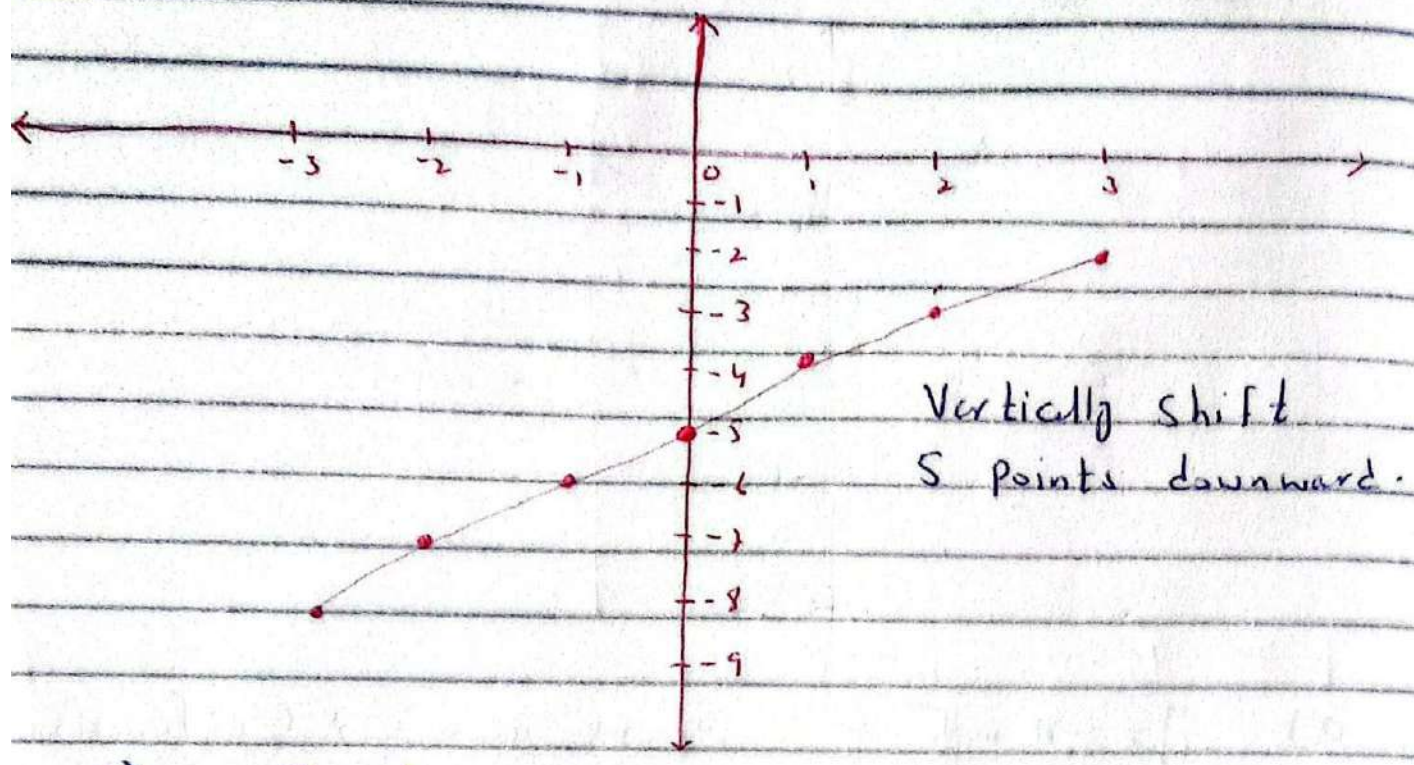
vertically shift
5 points upwards.

Function میں سے کرتی minus ہوگی

b) $y = x - 5$

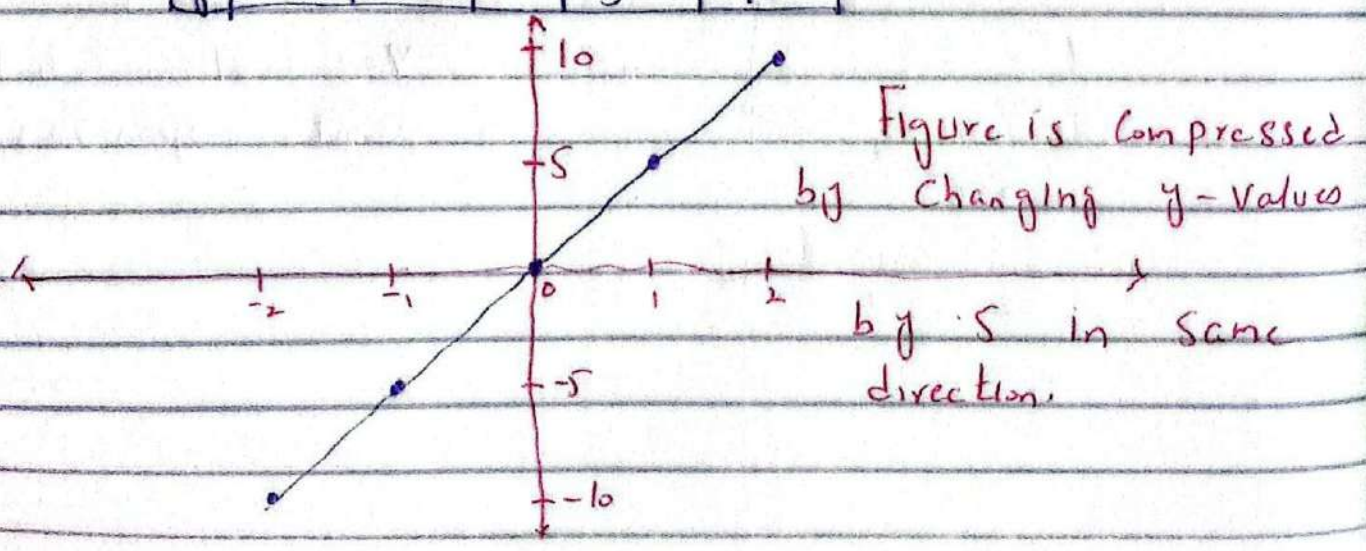
vertically downward

x	-3	-2	-1	0	1	2	3
y	-8	-7	-6	-5	-4	-3	-2



c) $y = 5x$

x	-2	-1	0	1	2
y	-10	-5	0	5	10



d) $y = -5x$

x	-2	-1	0	1	2
y	10	5	0	-5	-10

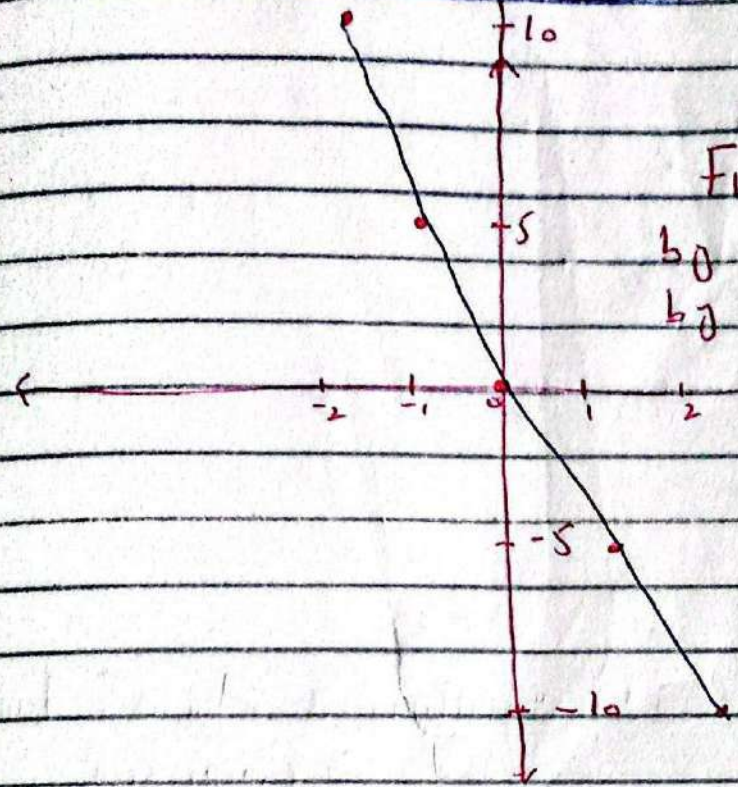


Figure is compressed by changing y-values by 5 in opposite direction

Rule for Category III
Q# 7, 8, 9

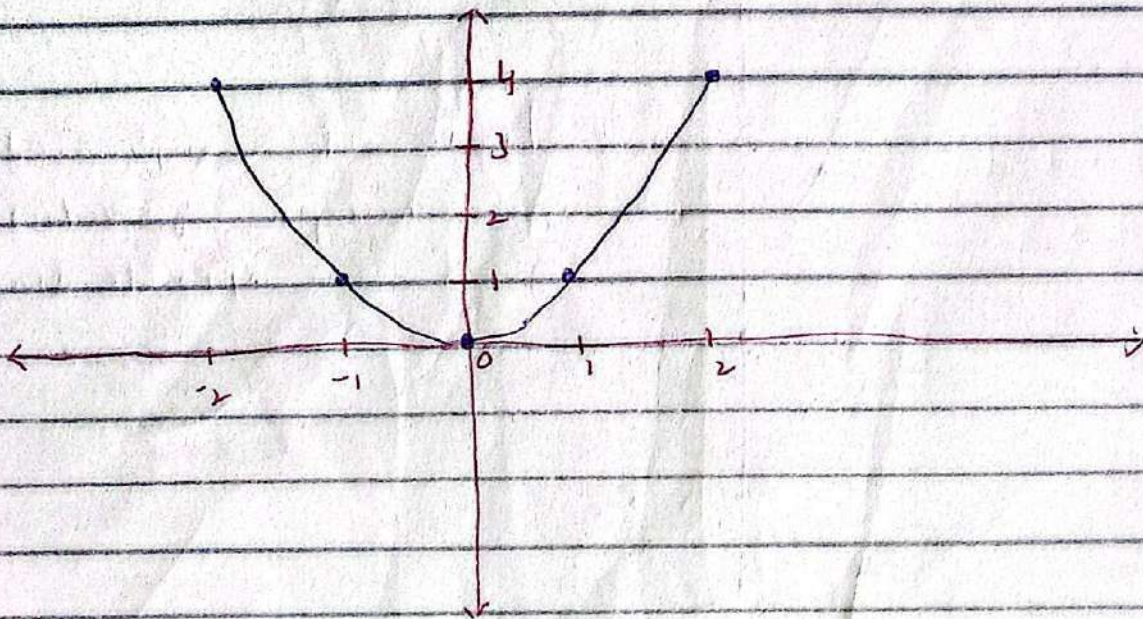
- When a constant is divided by x then stretching occurs. In graph of x-values.
- When a constant is divided by y, then stretching is done by values of y.

Q#7

y = x^2

Sol

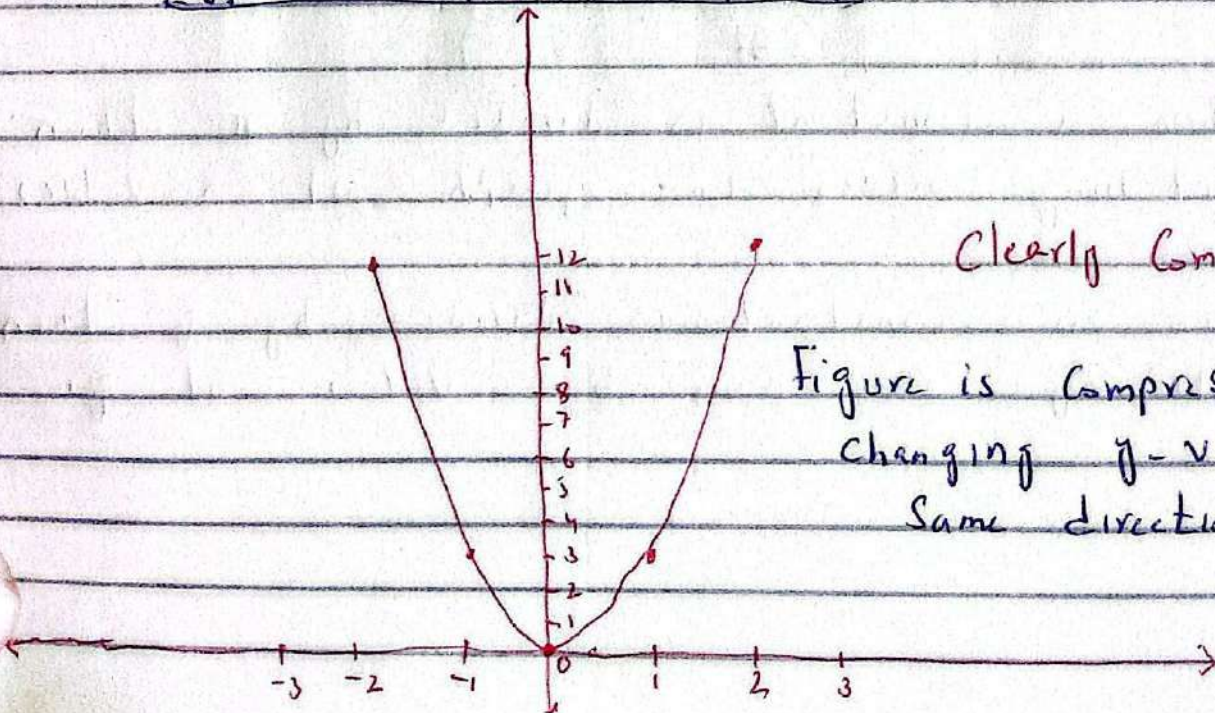
x	-2	-1	0	1	2
y	4	1	0	1	4



a) y = 3x^2

Function کے ساتھ 3 سے multiply کرنے سے Compressed graph آئے گا

x	-2	-1	0	1	2
y	12	3	0	3	12



Clearly Compressed

Figure is Compressed by changing y-values in same direction.

b) $y = -3x^2$

x	-2	-1	0	1	2
y	-12	-3	0	-3	-12

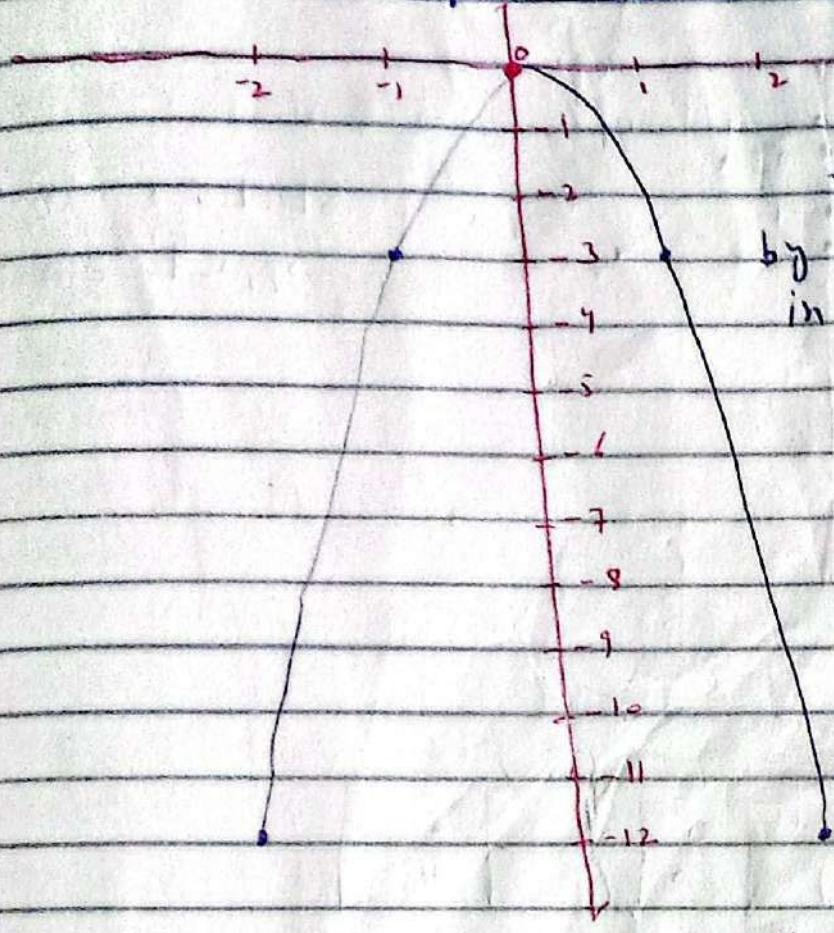


Figure is compressed by changing y-values in opposite direction.

اب یہ divide پورے گئے تو اب stretched graph ہو گا۔

c) $y = \frac{x^2}{3}$

x	-2	-1	0	1	2
y	1.3	0.3	0	0.3	1.3

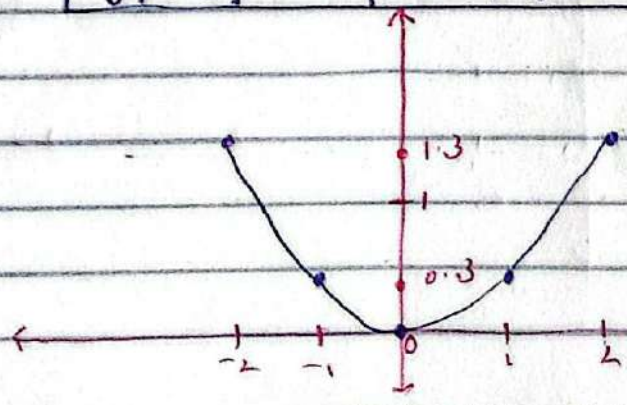
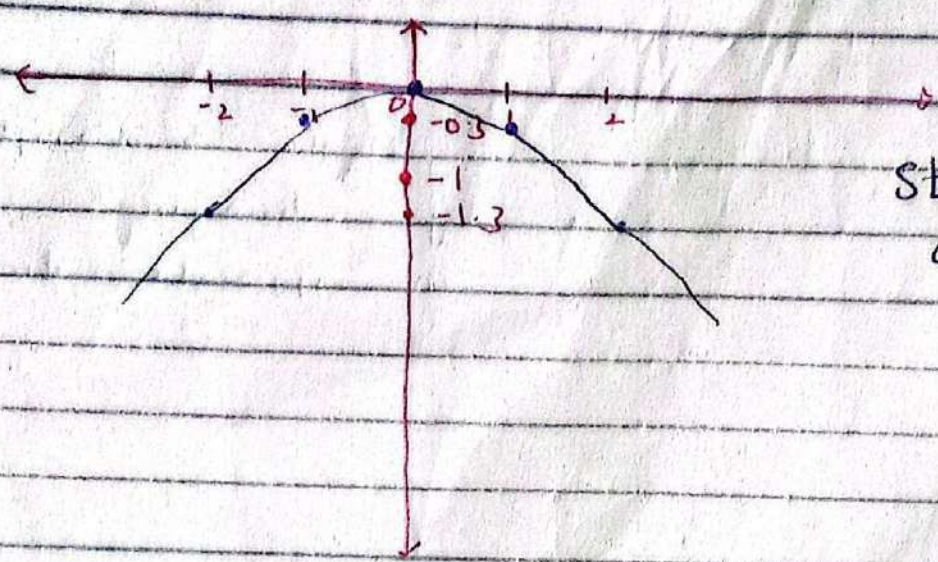


Figure is stretched by changing values of y by 3 in same direction.

d) $y = -\frac{x^2}{3}$

x	-2	-1	0	1	2
y	-1.3	-0.3	0	-0.3	-1.3



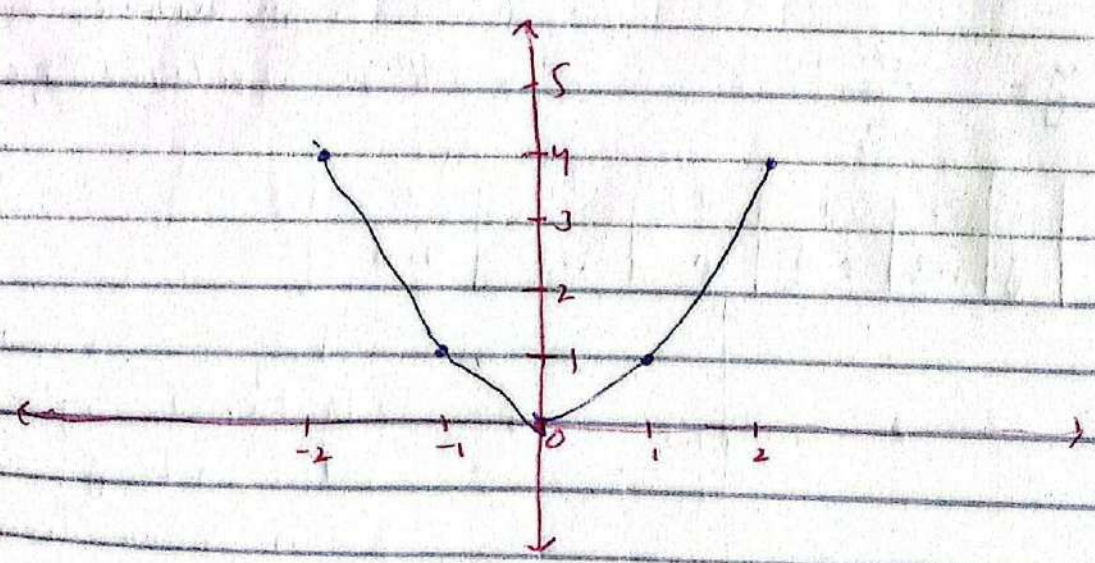
Stretched in opposite direction.

8

$y = x^2$

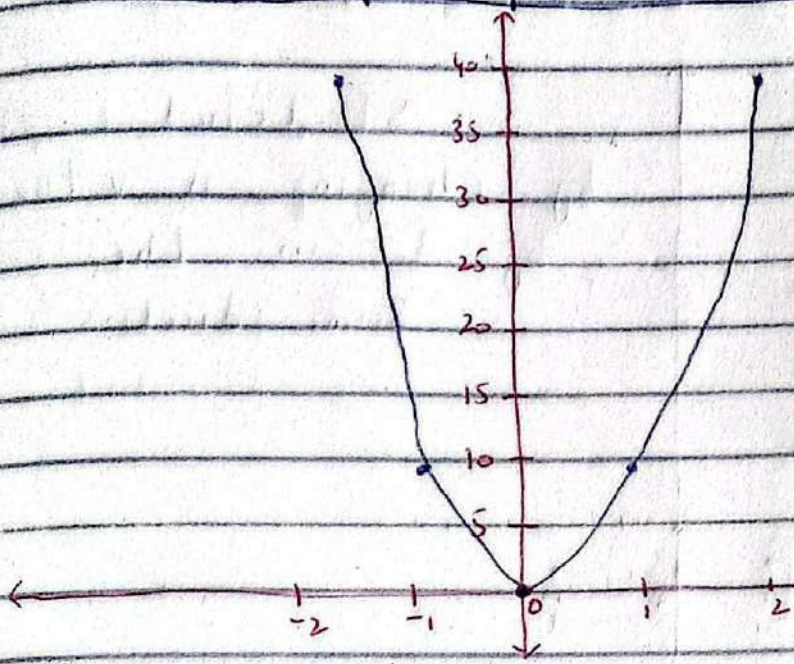
Sol

x	-2	-1	0	1	2
y	4	1	0	1	4



a) $y = (3x)^2$

x	-2	-1	0	1	2
y	36	9	0	9	36

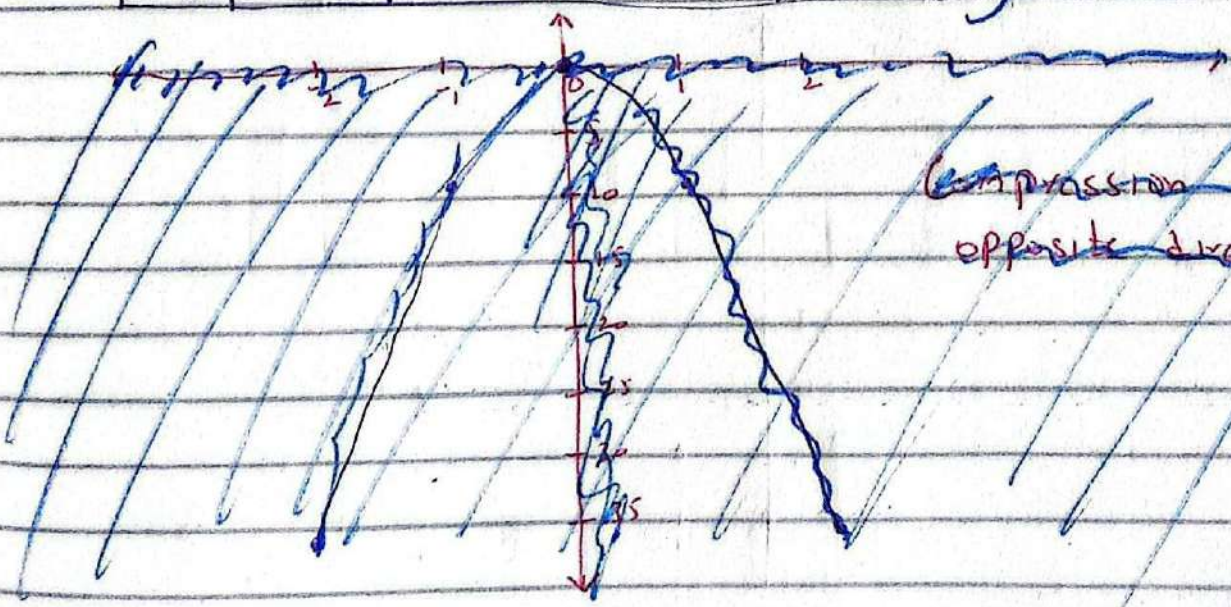


Compression by changing value of x by 3 in same direction.

b) $y = (-3x)^2$

x	-2	-1	0	1	2
y	36	9	0	9	36

Same as above graph.

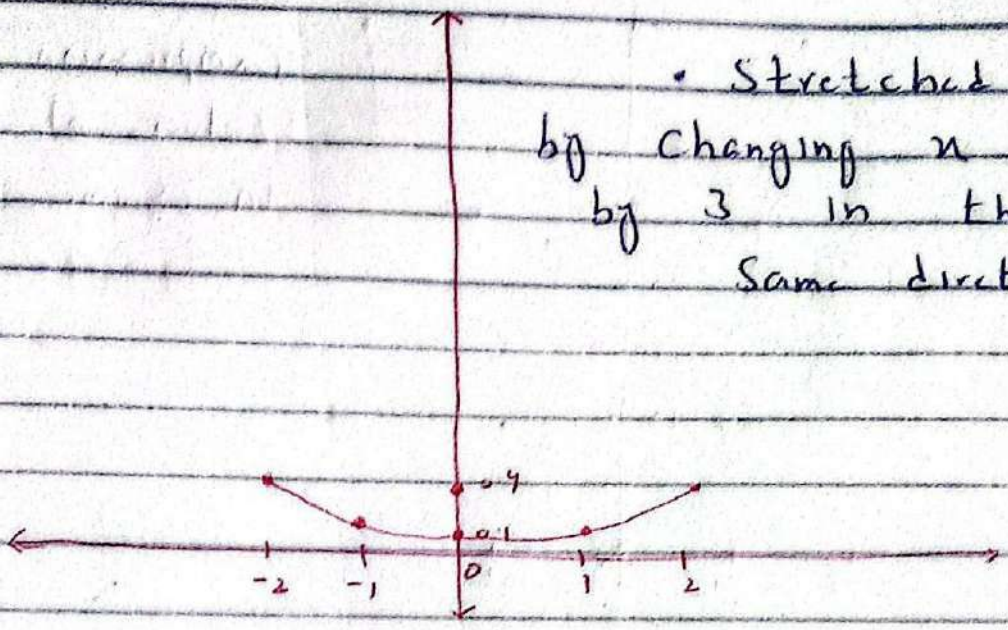


Compression in opposite direction.

c) $y = \left(\frac{x}{3}\right)^2$

d) $y = \left(\frac{-x}{3}\right)^2$

x	-2	-1	0	1	2
y	0.4	0.1	0	0.1	0.4

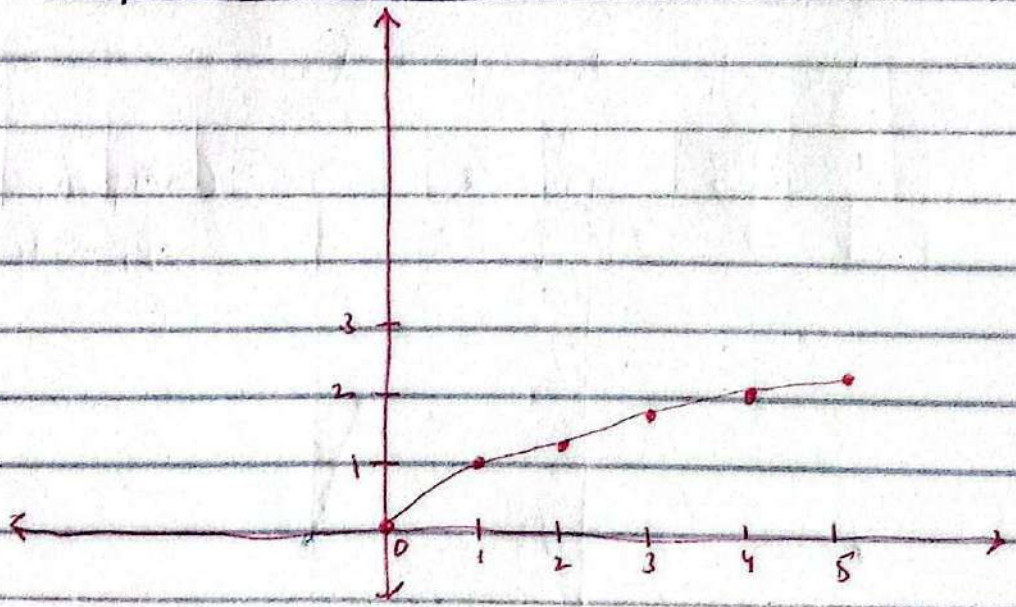


• Stretched Graph
by changing x values
by 3 in the
same direction.

Q #9

$y = \sqrt{x}$

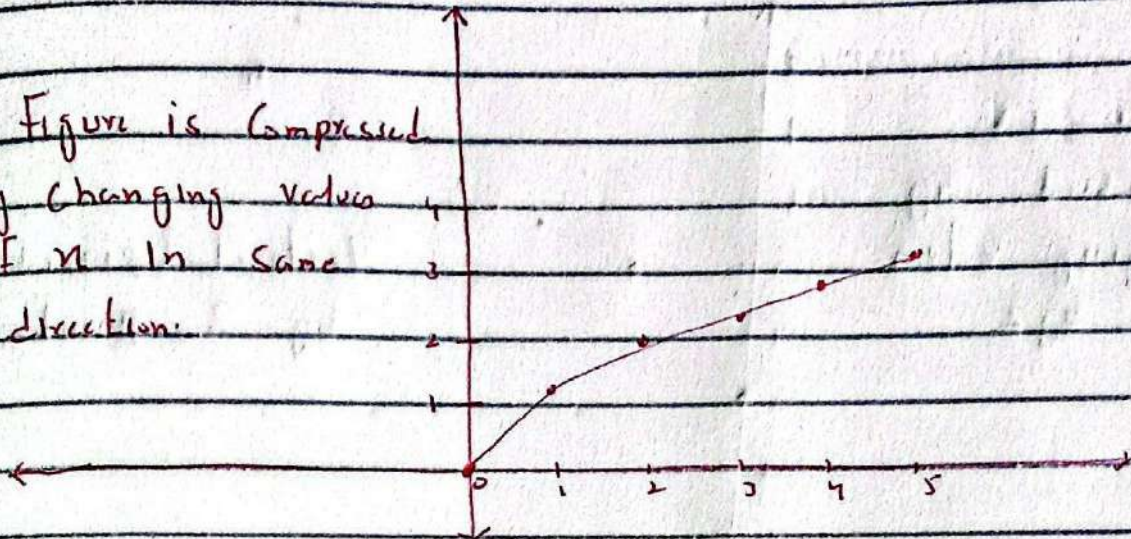
x	0	1	2	3	4	5
y	0	1	1.4	1.7	2	2.2



a) $y = \sqrt{2x}$ Change in x .

x	0	1	2	3	4	5
y	0	1.4	2	2.4	2.8	3.2

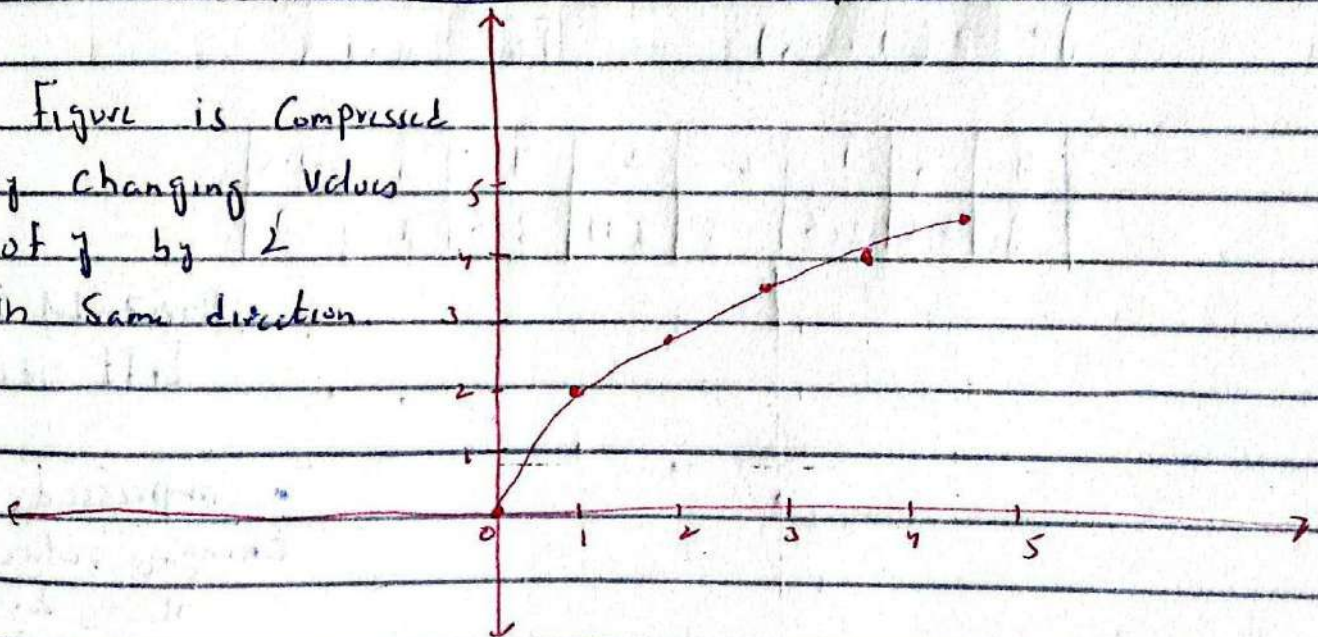
Figure is Compressed by changing values of x in same direction.



b) $y = 2\sqrt{x} = 2y$ Change in y .

x	0	1	2	3	4	5
y	0	2	2.8	3.6	4	4.7

Figure is Compressed by changing values of y by 2 in same direction.

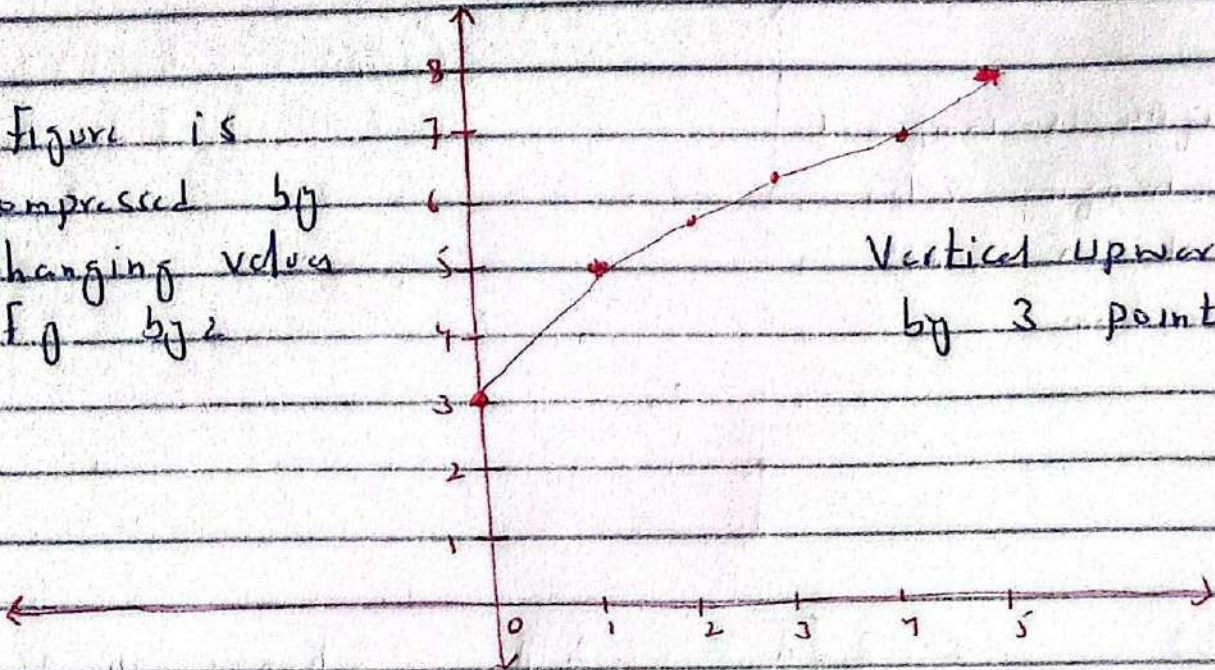


$y = 2\sqrt{x} + 3$

x	0	1	2	3	4	5
y	3	5	5.8	6.4	7	

Figure is compressed by changing values of x by 2

Vertical upwards by 3 points.



d) $y = \sqrt{2x+5}$

$$2x+5 \ge 0$$

$$x \ge -5/2$$

$$x \ge -2.5$$

Change in x -values

$y = \sqrt{2(x+2.5)} = \sqrt{2} \sqrt{x+2.5}$

x	0	1	2	3	4	5	-2.5
y	2.2	2.6	3	3.31	3.6	3.8	0

• Horizontal shift left side

• Compressed by changing values of x by 2.

