

Name

"Teacher"

112

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Section 2.Q.2

Graphing $y = ax^2 + k$

(Vertical Transformations)

Ex. 1

$y = 3x^2$

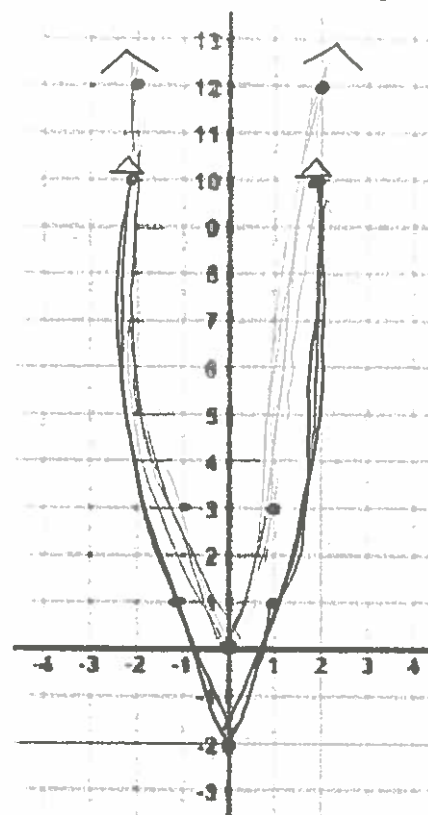
x	$3x^2$	y	$f(x) = y$	(x, y)
0	$3(0)^2$	0	$f(0) = 0$	(0, 0)
1	$3(1)^2$	3	$f(1) = 3$	(1, 3)
2	$3(2)^2$	12	$f(2) = 12$	(2, 12)

- vertex
(0, 0)

$y = 3x^2 - 2$

x	$3x^2 - 2$	y	$f(x) = y$	(x, y)
0	$3(0)^2 - 2$	-2	$f(0) = -2$	(0, -2)
1	$3(1)^2 - 2$	1	$f(1) = 1$	(1, 1)
2	$3(2)^2 - 2$	10	$f(2) = 10$	(2, 10)

- vertex
(0, -2)



How is the graph of $y = 3x^2 - 2$ different from the graph of $y = 3x^2$?

- a. It is shifted 2 units up.
- b. It is shifted 2 units down.
- c. It is shifted 2 units to the right.
- d. It is shifted 2 units to the left.

You Try 2

How is the graph of $y = 2x^2 + 1$ different from the graph of $y = 2x^2$?

- a. It is shifted 1 unit up.
- b. It is shifted 1 unit down.
- c. It is shifted 1 unit to the right.
- d. It is shifted 1 unit to the left.

You Try 3

How is the graph of $y = 4x^2 + 3$ different from the graph of $y = 4x^2 - 1$?

- a. It is shifted 4 units up.
- b. It is shifted 3 units up.
- c. It is shifted 4 units down.
- d. It is shifted 1 unit down.



Graphing $y = (x - h)^2$

(Horizontal Transformations)

Ex. 4

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

x	$(x - 2)^2$	y	$f(x) = y$	(x, y)
2	$(2 - 2)^2$	0	$f(2) = 0$	$(2, 0)$
3	$(3 - 2)^2$	1	$f(3) = 1$	$(3, 1)$
4	$(4 - 2)^2$	4	$f(4) = 4$	$(4, 4)$

Where is the axis of symmetry (AOS)?

$$y \text{ axis } \quad x = 2$$

What is the vertex?

$$(2, 0)$$

Ex. 5

$$y = x^2 \text{ (parent function)}$$

x	x^2	y	$f(x) = y$	(x, y)
0	0^2	0		
1	1^2	1		
2	2^2	4		

Where is the axis of symmetry (AOS)?

$$y \text{ axis } \quad x = 0$$

What is the vertex?

$$(0, 0)$$

7) How is the graph of $y = (x - 2)^2$ different from the parent function?

Shift 2 units right

8) How is the graph of $y = (x + 2)^2$ different from the parent function?

Shift 2 units left.

9) How is the graph of $y = (x - 2)^2$ different from the graph of $y = (x + 2)^2$?

Shift 4 units right

Key Ideas:

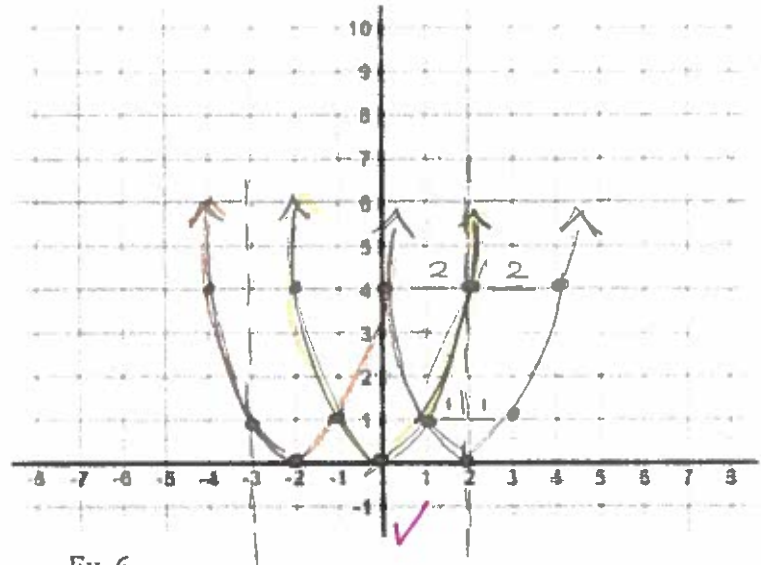
Vertical transformations are from adding (up) or subtracting (down) k AFTER the x^2 .
Horizontal transformations are from the sign of the h WITHIN the x^2 .

$$(x - \underbrace{-h})^2 \rightarrow (x + h)^2$$

move left

$$(x - \underbrace{+h})^2 \rightarrow (x - h)^2$$

move right



Ex. 6

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

x	$(x + 2)^2$	y	$f(x) = y$	(x, y)
-2	$(-2 + 2)^2$	0	$f(-2) = 0$	$(-2, 0)$
-1	$(-1 + 2)^2$	1	$f(-1) = 1$	$(-1, 1)$
0	$(0 + 2)^2$	4	$f(0) = 4$	$(0, 4)$

Where is the axis of symmetry (AOS)?

$$y \text{ axis } \quad x = -2$$

What is the vertex?

$$(-2, 0)$$