Graphing $y = ax^2 + k$ **(Vertical Transformations)**
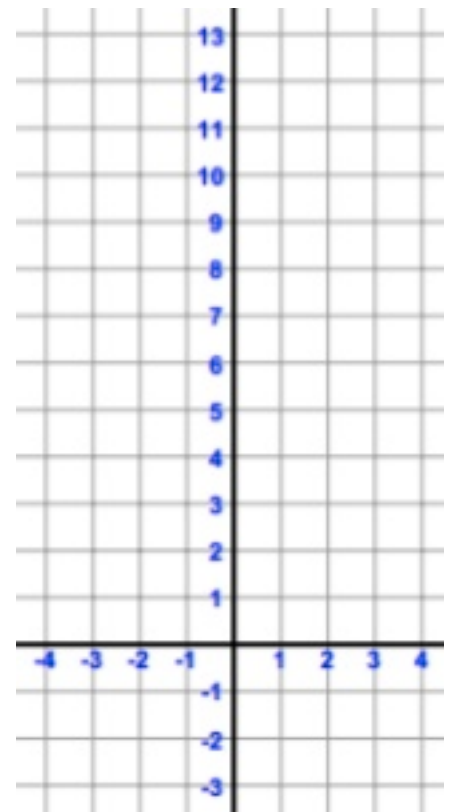
Ex. 1

$y = 3x^2$

x		y	$f(x) = y$	(x, y)

$y = 3x^2 - 2$

x		y	$f(x) = y$	(x, y)

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

a. It is shifted 2 units up.   c. It is shifted 2 units to the right.
b. It is shifted 2 units down.   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.   c. It is shifted 1 unit to the right.
b. It is shifted 1 unit down.   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.   c. It is shifted 4 units down.
b. It is shifted 3 units up.   d. It is shifted 1 unit down.

Graphing $y = (x - h)^2$ **(Horizontal Transformations)**

Ex. 4

$y = (x - 2)^2$

x		y	$f(x) = y$	(x, y)

Where is the axis of symmetry (AOS)?

What is the vertex?

Ex. 5

$y = x^2$ (parent function)

x		y	$f(x) = y$	(x, y)

Where is the axis of symmetry (AOS)?
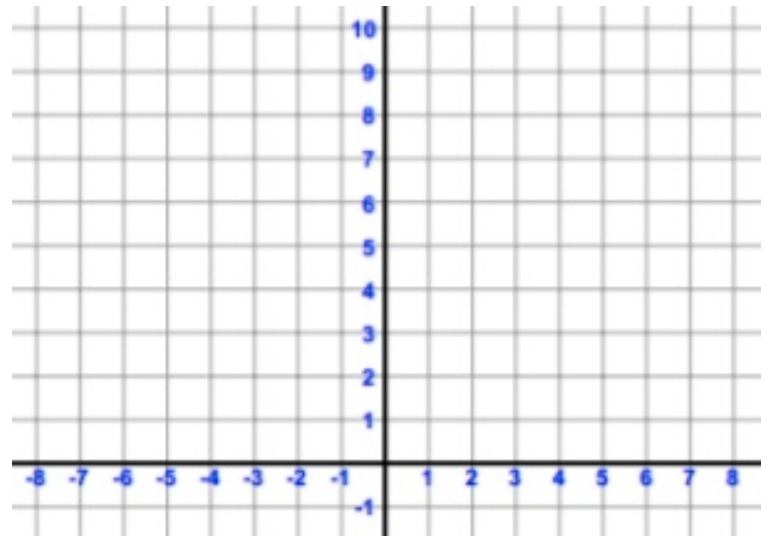
What is the vertex?

Ex. 6

$y = (x + 2)^2$

x		y	$f(x) = y$	(x, y)

Where is the axis of symmetry (AOS)?

What is the vertex?

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

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

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

Key Ideas:

Vertical transformations are from adding (_____) or subtracting (_____) k AFTER the x^2.

Horizontal transformations are from the sign of the h WITHIN the x^2.

$(x - -h)^2 \rightarrow$ $(x - +h)^2 \rightarrow$