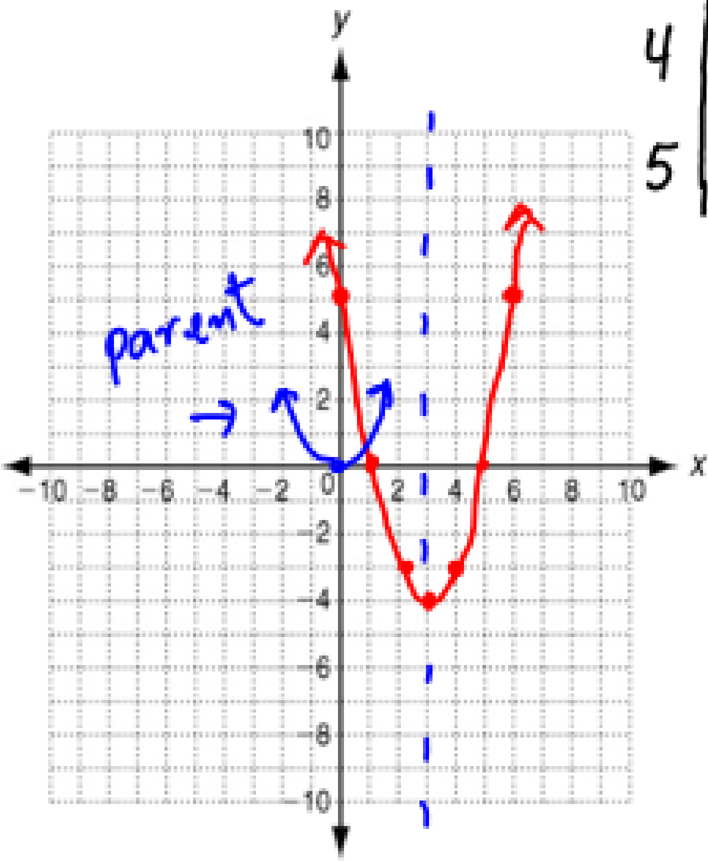
Graph) $y = x^2 - 6x + 5$

Vertex: $(3, -4)$ A.O.S.: $x = 3$

y-int: $(0, 5)$ Max/Min -4

Domain: $\{x \mid x \in \mathbb{R}\}$ Range: $\{y \mid y \geq -4\}$

x	y
4	$16 - 24 + 5 = -3$
5	$25 - 30 + 5 = 0$



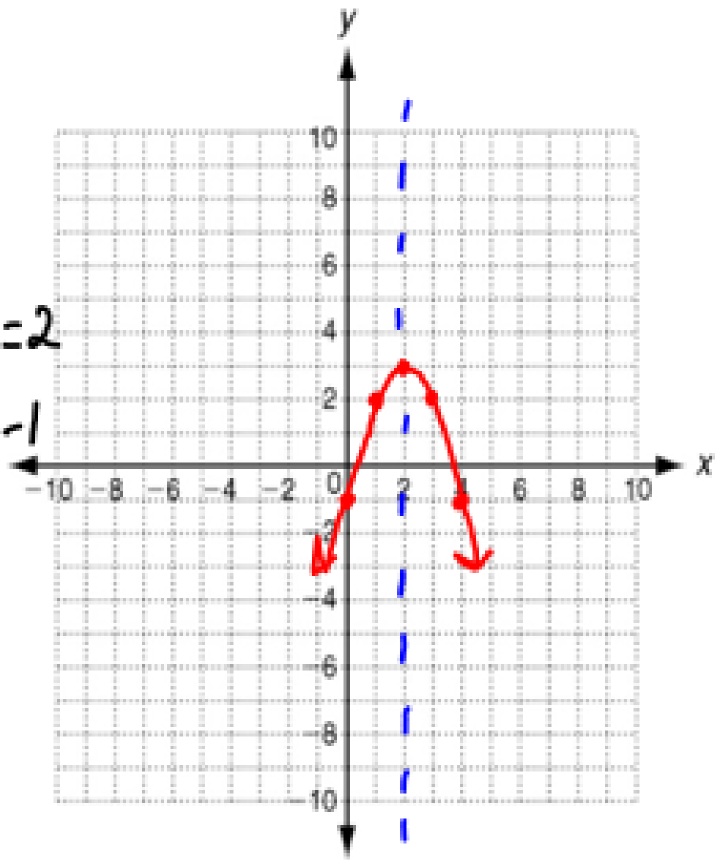
Graph) $g(x) = -(x-2)^2 + 3$

Vertex: $(2, 3)$ A.O.S.: $x = 2$

y-int: $(0, -1)$ Max/Min. 3

Domain: $\{x \mid x \in \mathbb{R}\}$ Range: $\{y \mid y \leq 3\}$

x	y
3	$-(3-2)^2 + 3 = 2$
4	$-(4-2)^2 + 3 = -1$



8.5 Transforming Quadratic Functions

Compared to the function $f(x) = x^2$, a quadratic function will become narrower or wider depending on the value of a: the smaller |a| is the wider graph will be.

Example) $\underbrace{f(x) = x^2}_{\text{parent}}$ and $g(x) = \frac{1}{3}x^2$

g(x) is wider than f(x) because the a is smaller.

Order the following from the widest to narrowest.

$f(x) = -3x^2$ $\quad$ $g(x) = \frac{1}{2}x^2$ $\quad$ $h(x) = 2x^2$

g(x), h(x), f(x)

For move up or down, depends on the c or the k in the equation.

If c or k is positive, the graph shifts up c or k units

If c or k is negative, the graph shifts down c or k units.

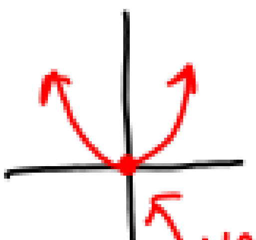
Example) Compare the graph $h(x) = x^2 - 4$ to $f(x) = x^2$

$f(x) = x^2$

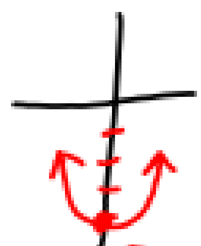
parent function

$h(x) = x^2 - 4$

$c = -4$



vertex (0,0)



vertex (0, -4)

Compare the graphs of the functions below.

1) $f(x) = x^2$ *and* $g(x) = 2x^2$

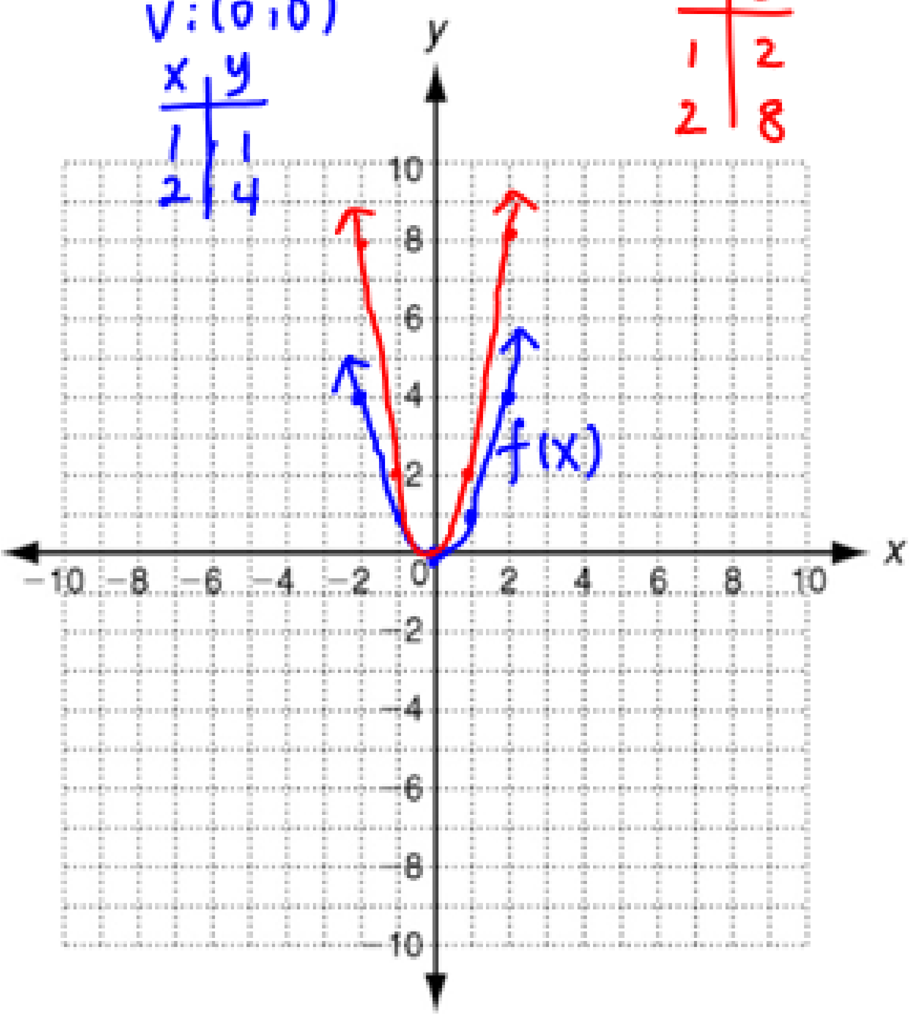
parent

V: (0,0)

x	y
1	2
2	8

V: (0,0)

x	y
1	1
2	4



Width: g(x) is narrower than f(x).

Open: Both open up.

Vertex: Same vertex (0,0)

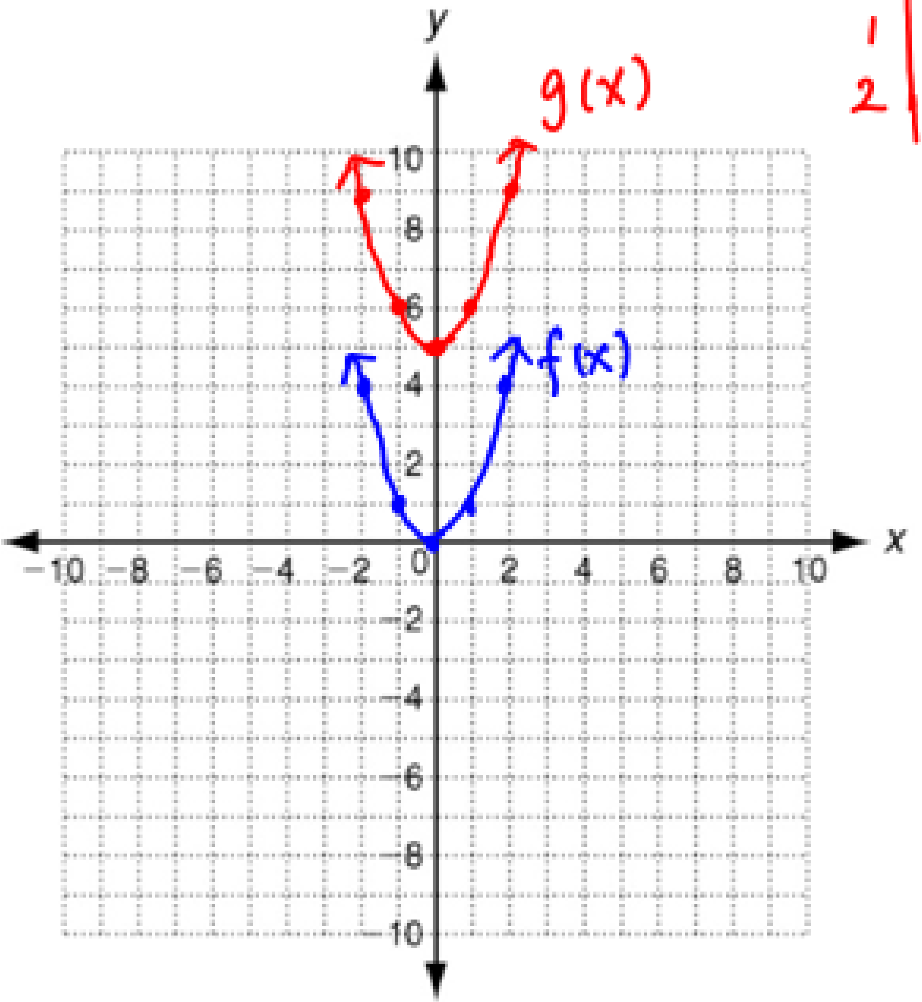
A.O.S: Same A.O.S. x = 0

2) $f(x) = x^2$ and $g(x) = x^2 + 5$

parent

Vertex: (0, 5)

x	y
1	6
2	9



Width: Same width

Up/Down: g(x) moves 5 units up

Open: Both open up.

Vertex: g(x) : (0, 5) ; f(x) : (0, 0)

A.O.S: Same A.O.S. $x = 0$

3) Compare $g(x) = 3x^2 + 2$ *to* $f(x) = x^2$ without graphing.

a c

Width: g(x) is narrower than f(x).

Up/Down: g(x) moves 2 units up.

Open: Both open up.

Vertex: g(x) : (0,2) ; f(x) : (0,0)

A.O.S: Same A.O.S. x = 0

4) Compare $g(x) = -2x^2 - 1$ *to* $f(x) = x^2$ without graphing.

Width: g(x) is narrower than f(x).

Up/Down: g(x) moves 1 unit down

Open: g(x) opens down ; f(x) opens up.

Vertex: g(x) : (0, -1) ; f(x) : (0, 0)

A.O.S: Same A.O.S. x = 0

Try) Compare $g(x)=\frac{1}{4}x^2+4$ *to* $f(x)=x^2$ without graphing.

Width: g(x) is wider than f(x).

Up/Down: g(x) moves 4 units up

Open: both open up

Vertex: g(x) : (0,4) ; f(x) : (0,0)

A.O.S: Same AOS : x = 0

Try) Compare $g(x)=-5x^2-1$ *to* $f(x)=x^2$ without graphing.

Width: g(x) is narrower than f(x)

Up/Down: g(x) moves 1 unit down

Open: g(x) opens down ; f(x) opens up

Vertex: g(x) : (0,-1) ; f(x) : (0,0)

A.O.S: Same AOS : x = 0