

f(x) means y

LESSON 9-4

Reteach

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 . It will translate up or down depending on the value of c .

For a quadratic function $f(x) = ax^2 + bx + c$:

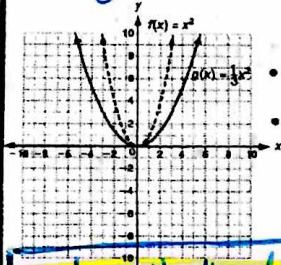
If $ a < 1$	graph is wider
If $ a > 1$	graph is narrower
For any change in a , the vertex and axis of symmetry are the same.	

If $c > 0$	graph shifts up
If $c < 0$	graph shifts down
For any change in c , the vertex changes. The axis of symmetry is the same.	

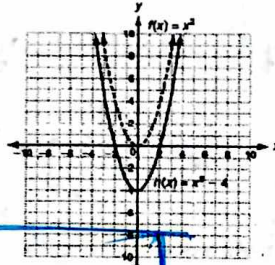
(like a rotation)
Compare the graph of $g(x) = \frac{1}{3}x^2$ to $f(x) = x^2$.

(like a translation)
Compare the graph of $h(x) = x^2 - 4$ to $f(x) = x^2$.

4 < 0 ⇒ shifts down



1/3 < 1 ⇒ wider
• $g(x)$ is wider than $f(x)$.
• The vertex is the same.

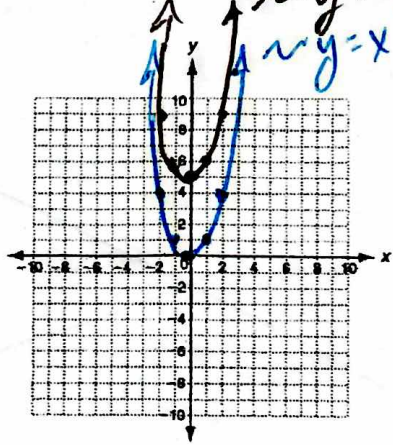
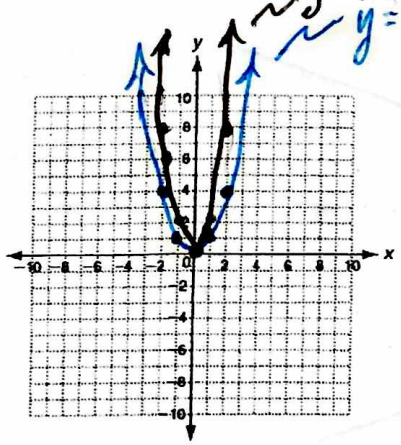


• $h(x)$ is translated down 4 units.
• The vertex of $f(x)$ is $(0, 0)$.
The vertex of $g(x)$ is $(0, -4)$.

When "a" changes sign, the parabola opens the opposite direction.
Compare the graphs of the functions below.

1. $f(x) = x^2$ and $g(x) = 2x^2$ *(like a reflection)*

2. $f(x) = x^2$ and $h(x) = x^2 + 5$



The graph of $y = 2x^2$ is narrower than the graph of $y = x^2$.

The graph of $y = x^2 + 5$ is shifted up 5 units more than $y = x^2$.

LESSON
9-4 **Practice C**
Transforming Quadratic Functions

Order the functions from narrowest graph to widest.

1. $f(x) = 1x^2$; $g(x) = -3x^2$

$g(x), f(x)$

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

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

3. $f(x) = \frac{1}{2}x^2$; $g(x) = -x^2$; $h(x) = .8x^2$

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

4. $f(x) = \frac{1}{3}x^2$; $g(x) = -0.25x^2$; $h(x) = 0.5x^2$

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

Compare the graph of each function with the graph of $f(x) = x^2$.

5. $g(x) = 3.5x^2 + 2$ The graph of $g(x)$ is narrower. The graph of $g(x)$ is 2 units above $f(x)$.

6. $g(x) = -\frac{1}{10}x^2$ The graph of $g(x)$ opens down. The graph of $g(x)$ is wider.

7. $g(x) = -\frac{1}{2}x^2 - 4$ The graph of $g(x)$ opens down, it is wider, and it is 4 units below $y = x^2$.

8. $g(x) = 6x^2 + \frac{1}{2}$ The graph of $g(x)$ is narrower and moves up $\frac{1}{2}$ unit from $y = x^2$.

9. Two hikers at different outlooks drop stones at the same time. One hiker is at an elevation of 5184 feet; the other is at an elevation of 4624 feet.

a. Write, sketch, and compare the two height functions.

b. How much sooner will the stone dropped from the lower elevation hit the ground?

