Algebra 1

Our Goal: To learn to graph quadratic functions
of the form $f(x) = ax^2 + c$

Warm Up: Intercepts review

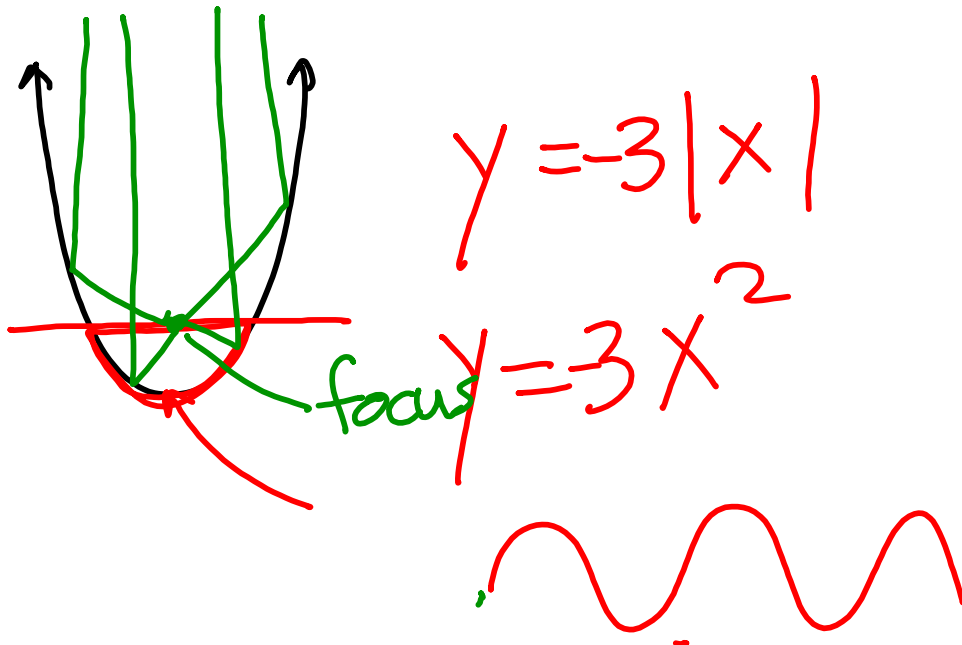Today's Homework
8.2 Exercises, p.429: 4-28 (evens)
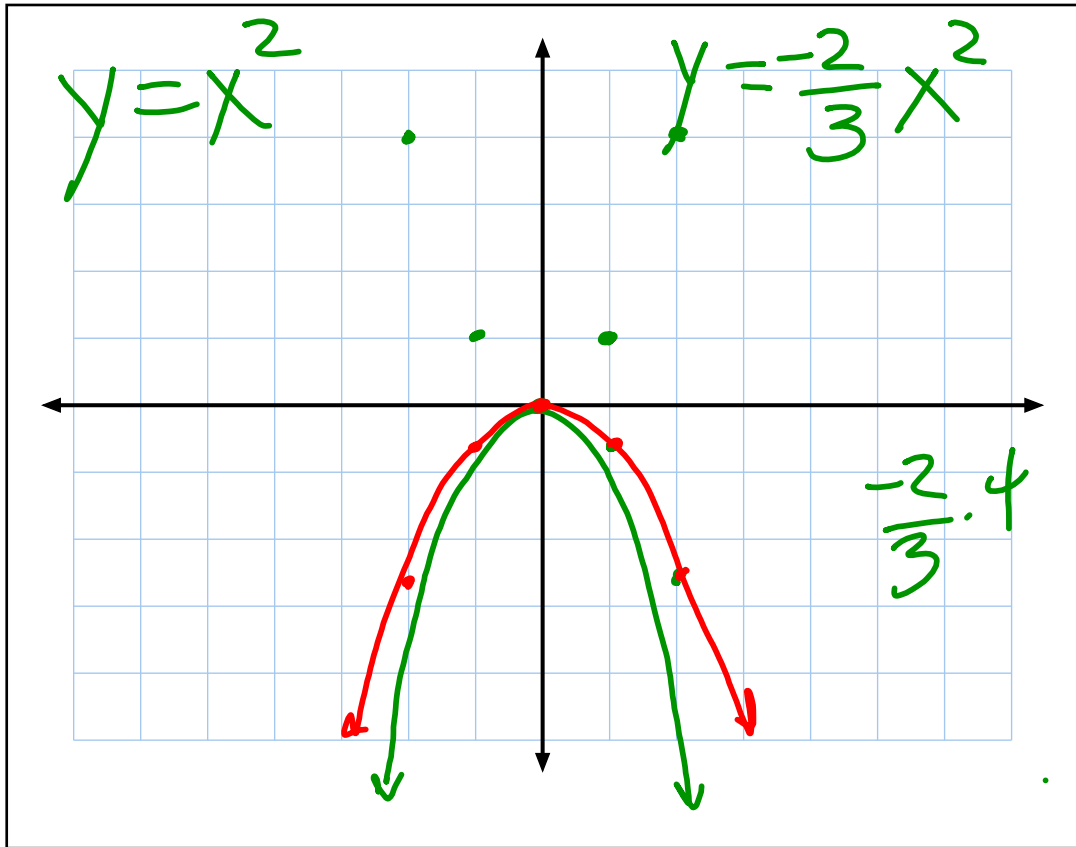 use the TI-84 for graphing (graph paper online, if needed)

Previous Homework
· 8.1 Exercises, p.423-424: 4-28 (multiples of 4)
  use the TI-84 for graphing (graph paper online, if needed)
· Correct any test mistakes on a separate sheet of paper for partial credit

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

$$-\frac{2}{3} \cdot 4$$

Find the *x*- and *y*-intercepts.

1. ☐ + y = 4

x-int: 4
y-int: 4

2. $y = x - 11$

3. $y = 2x - 13$

$0 = 2x - 13$

x-int: 6½
y-int -13

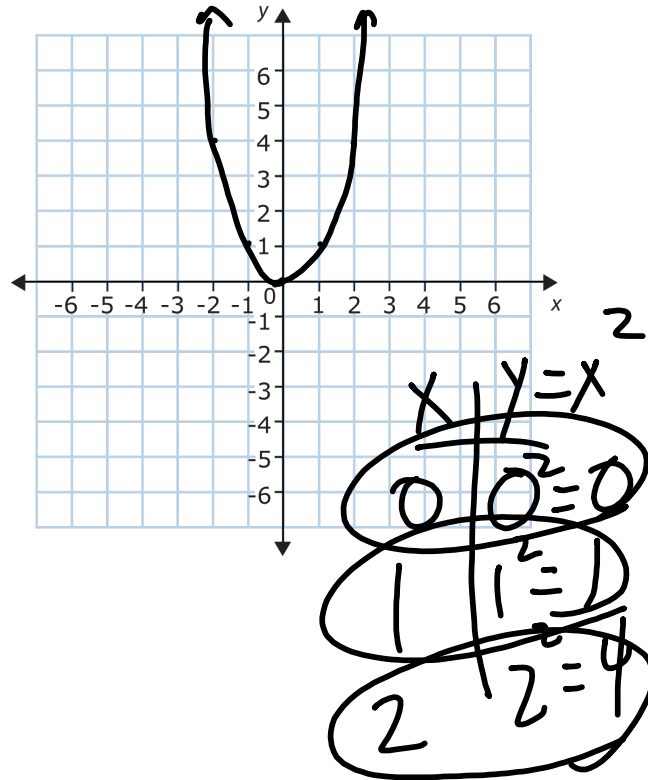**4.** $2x - 5y = -1$

$x = -\frac{1}{2}$
$y = \frac{1}{5}$

5. $6x - y = 12$
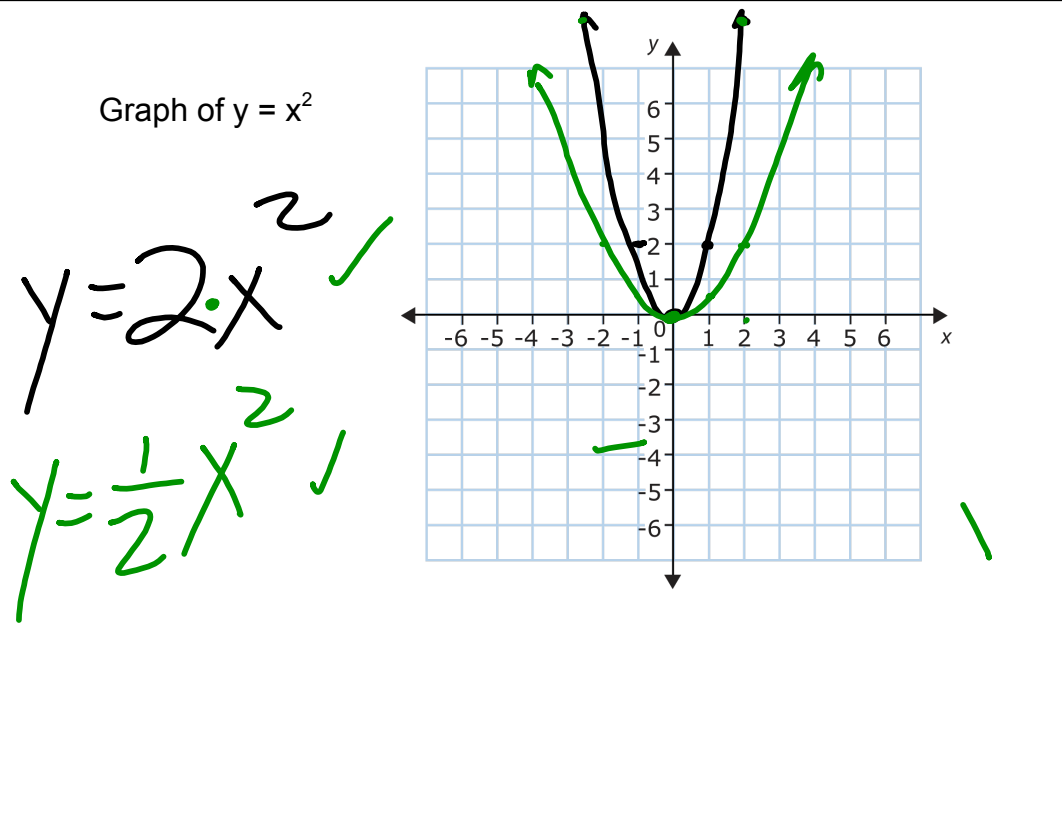
6. $y = \frac{1}{6}x + 3$

Graph of $y = x^2$

$y = x^2$

x	x^2 =
0	$0^2 = 0$
1	$1^2 = 1$
2	$2^2 = 4$

Graph of $y = x^2$

$y = 2 \cdot x^2$ ✓

$y = \frac{1}{2}x^2$ ✓
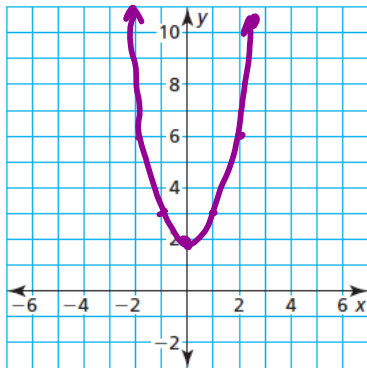
Essential Question

How does the value of c affect the graph of $f(x) = ax^2 + c$?
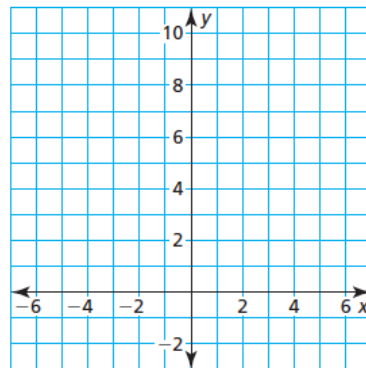
$$y = |x| + 3$$

Work with a partner. Sketch the graphs of the functions in the same coordinate plane. What do you notice?
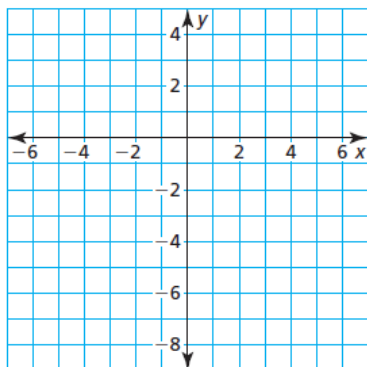
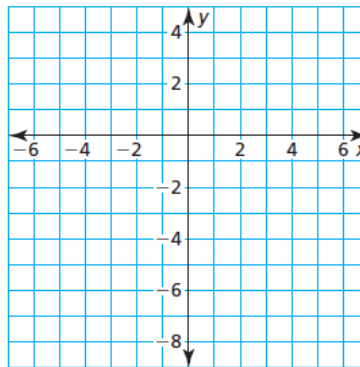**a.** $f(x) = x^2$ and $g(x) = x^2 + 2$ **b.** $f(x) = 2x^2$ and $g(x) = 2x^2 - 2$

Work with a partner. Graph each function. Find the *x*-intercepts of the graph. Explain how you found the *x*-intercepts.

a. $y = x^2 - 7$

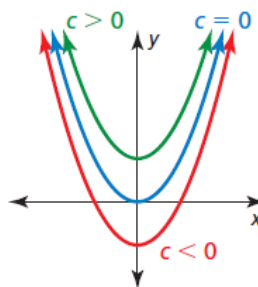**b.** $y = -x^2 + 1$

Core Concept

Graphing $f(x) = ax^2 + c$

- When $c > 0$, the graph of $f(x) = ax^2 + c$ is a vertical translation c units up of the graph of $f(x) = ax^2$.

- When $c < 0$, the graph of $f(x) = ax^2 + c$ is a vertical translation $|c|$ units down of the graph of $f(x) = ax^2$.

The vertex of the graph of $f(x) = ax^2 + c$ is $(0, c)$, and the axis of symmetry is $x = 0$.

Graph $g(x) = x^2 - 2$. Compare the graph to the graph of $f(x) = x^2$.

Graph the function. Compare the graph to the graph of $f(x) = x^2$.

1. $g(x) = x^2 - 5$ **2.** $h(x) = x^2 + 3$

Graph $g(x) = 4x^2 + 1$. Compare the graph to the graph of $f(x) = x^2$.

Let $f(x) = -0.5x^2 + 2$ and $g(x) = f(x) - 7$.

a. Describe the transformation from the graph of f to the graph of g. Then graph f and g in the same coordinate plane.

b. Write an equation that represents g in terms of x.

Graph the function. Compare the graph to the graph of $f(x) = x^2$.

3. $g(x) = 2x^2 - 5$

4. $h(x) = -\dfrac{1}{4}x^2 + 4$

5. Let $f(x) = 3x^2 - 1$ and $g(x) = f(x) + 3$.

a. Describe the transformation from the graph of f to the graph of g. Then graph f and g in the same coordinate plane.

b. Write an equation that represents g in terms of x.

The function $f(t) = -16t^2 + s_0$ represents the approximate height (in feet) of a falling object t seconds after it is dropped from an initial height s_0 (in feet). An egg is dropped from a height of 64 feet.

a. After how many seconds does the egg hit the ground?

b. Suppose the initial height is adjusted by k feet. How will this affect part (a)?

6. Explain why only nonnegative values of t are used in Example 4.

7. WHAT IF? The egg is dropped from a height of 100 feet. After how many seconds does the egg hit the ground?

Writing Prompt: The graph of $y = -4x^2 + 12$ is …