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

1. $x + y = 4$
2. $y = x - 11$
3. $y = 2x - 13$
4. $2x - 5y = -1$
5. $6x - y = 12$
6. $y = \frac{1}{6}x + 3$

Warm Up

- Solving for x-Intercept → make $y = 0$
- Solving for y-Intercept → make $x = 0$

Complete the statement with *always*, *sometimes*, or *never*. Explain your reasoning.

1. If $x^2 = y^2$, then x is _____ equal to $|y|$.
2. If x and y are real numbers, then $|x + y|$ is _____ equal to $|y + x|$.
3. For any real number d, the equation $|x + 5| = d$ will _____ have no solution.

Cumulative Warm Up

Vocab review

Essential Question

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

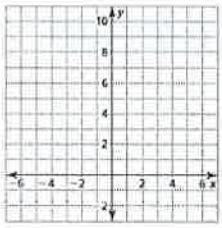
Essential Question

What you will learn

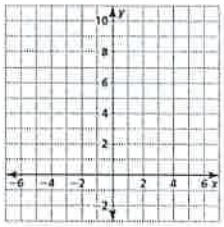
- Graph quadratic functions of the form $f(x) = ax^2 + c$
- Solve real-life problems involving functions of the form $f(x) = ax^2 + c$

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

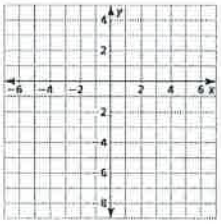


Exploration 1

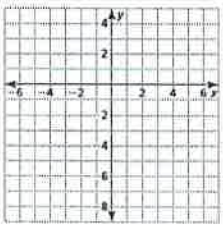
* practice

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. $y = -x^2 + 1$



Exploration 2

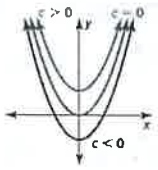
* practice

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 $x = 0$.



Core Concept

- additional translation work
- how does c affect the graph? shift up or down?
- y-intercept?

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

x	y
-2	2
-1	-1
0	-2
1	-1
2	2

Example 1

- parent function $f(x) = x^2$
- how did it change?
  - Create table of values
  - graph
  - compare

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

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

x	$x^2 - 5$	y
-2	$(-2)^2 - 5$	-1
-1	$(-1)^2 - 5$	-4
0	$(0)^2 - 5$	-5
1	$1^2 - 5$	-4
2	$2^2 - 5$	-1

2. $h(x) = x^2 + 3$

x	$x^2 + 3$	y
-2	$(-2)^2 + 3$	7
-1	$(-1)^2 + 3$	4
0	$0 + 3$	3
1	$1^2 + 3$	4
2	$2^2 + 3$	7

Monitoring Progress 1-2

* additional practice
  - create tables

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

Example 2

* Student practice

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.

$g(x) = f(x) - 7$

$= -0.5x^2 + 2 - 7$

$= -0.5x^2 - 5$

x	f(x)	g(x)
-4	-6	-13
-2	0	-7
0	2	-5
2	0	-7
4	-6	-13

Example 3

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

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

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

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.

Monitoring Progress 3-5

* Student practice

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?

The egg hits the ground after 2 seconds

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

if adjusted up k units → move right k units

Example 4

a.) make table of values

x	y
0	64
1	48
2	0

x-intercept = y is 0.

if adjusted down k units move left k units

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?

Monitoring Progress 6-7

6.) Negative values of t would represent time before the egg was dropped, which have no meaning in the context of this problem

7.) 2.5 sec.

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

Closure