

Algebra 1 9.1

Analyze characteristics of graphs of quadratic functions

Graph quadratic functions

quadratic $x^2 + \dots$

standard form

parabola - graph $x^2 + 3x + 5$

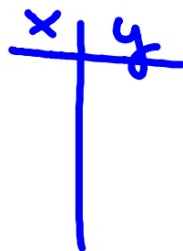
axis of symmetry

vertex

maximum

minimum

table of values



A hand-drawn coordinate system consisting of a vertical y-axis and a horizontal x-axis intersecting at the origin. The x-axis is labeled with 'x' and the y-axis is labeled with 'y'.

PemDAS

What happens when we square negative numbers?
Is there a difference between $-x^2$ and $-(x)^2$?

$$5^2 = 5 \cdot 5 = 25$$

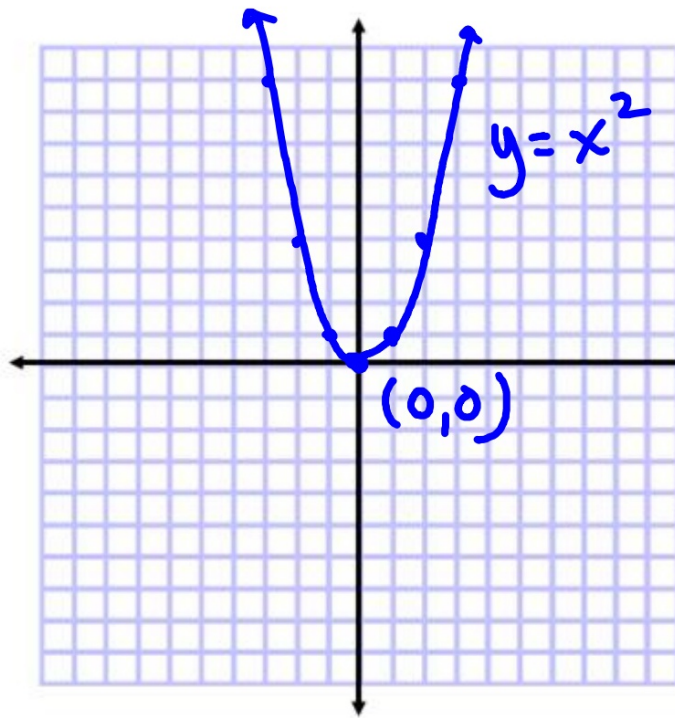
$$, \quad -5^2 = -25$$

$$(-5)^2 = -5 \cdot -5 = 25$$

Use a table of values to graph:
(remember order of operations...)

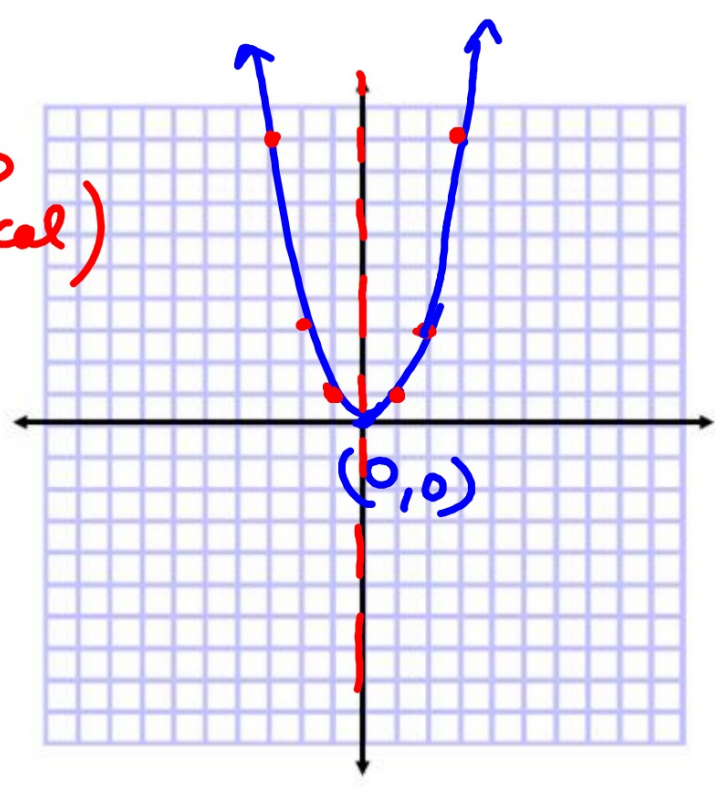
$$y = x^2 \text{ (parent graph)}$$

x	x^2	y
0	0^2	0
1	1^2	1
2	2^2	4
3	3^2	9
-1	$(-1)^2$	1
-2	$(-2)^2$	4
-3	$(-3)^2$	9

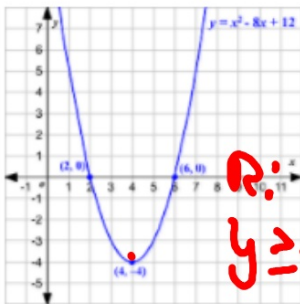
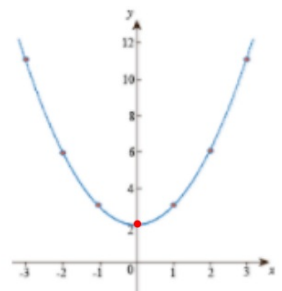
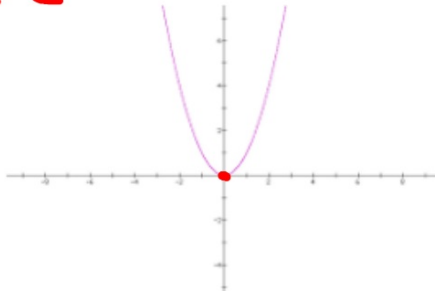
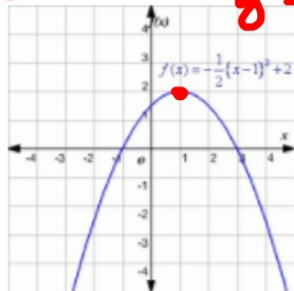
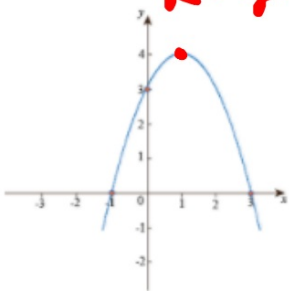


parabola
 $D(x) = \mathbb{R}$
 $R(y) = y \geq 0$

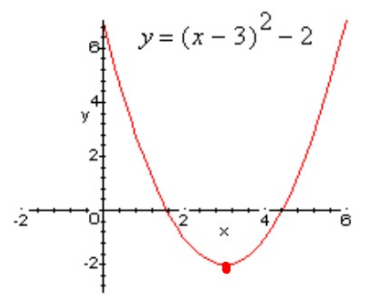
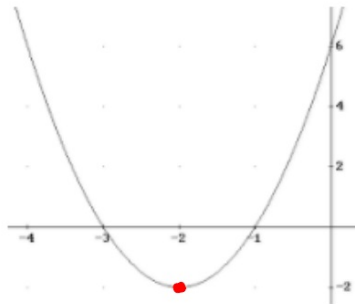
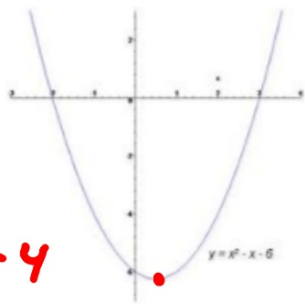
Vertex? turning pt-
★ Axis of symmetry? $x = 0$
domain?
range? (vertical)



$R: y \leq 4$ $y \leq 2$



$R: y \geq -4$



p. 543

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

KeyConcept Quadratic Functions

Parent Function:

$$f(x) = x^2$$

Standard Form:

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

Type of Graph:

parabola

Axis of Symmetry:

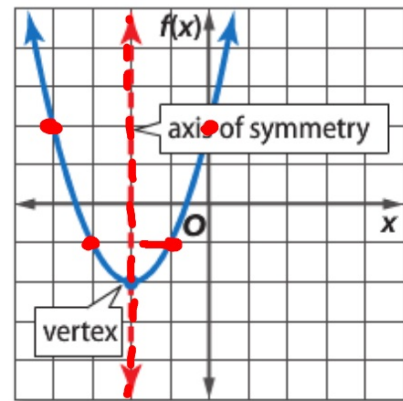
$$x = -\frac{b}{2a}$$

$$x = -\frac{-3}{2 \cdot 1}$$

y-intercept:

c

$$x = \frac{3}{2}$$



$$y = 2x^2 + 5$$

$$-\frac{b}{2a}$$

Use a table of values to graph $y = x^2$.

* Vertex?

* Axis of symmetry?

~~(parent graph)~~

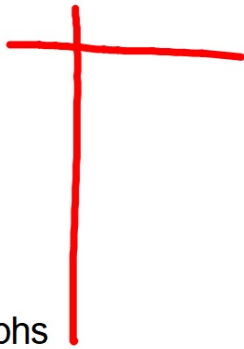
domain?

range?

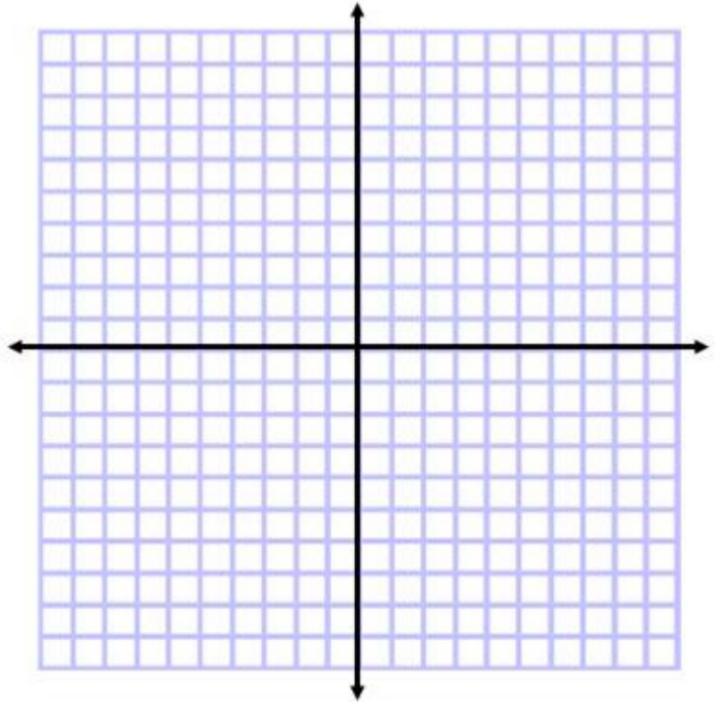
~~$2x^2 + 5$~~

$$y = 3x^2 + 5x - 13$$

$$x = \frac{-5}{6}$$



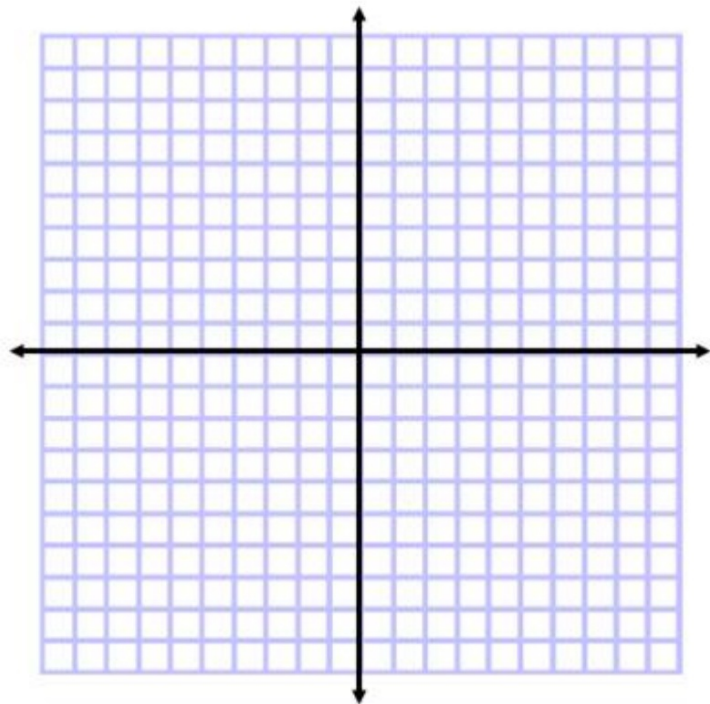
Giant graphs



Guided Practice

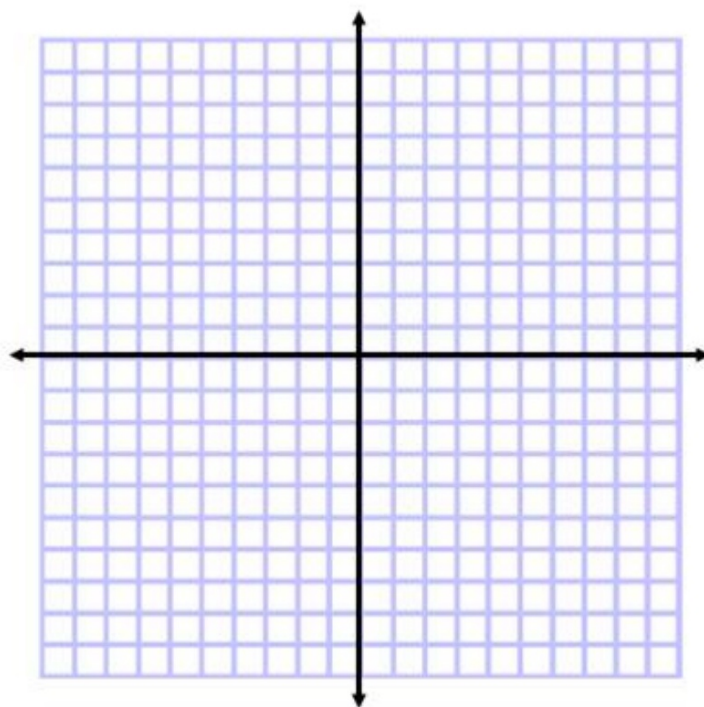
1. Use a table of values to graph $y = x^2 + 3$. State the domain and range.

Self-Check Practice



Example 1 Graph a Parabola

Use a table of values to graph $y = 3x^2 + 6x - 4$. State the domain and range.

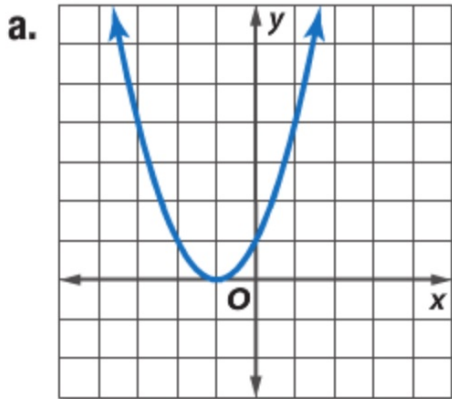


x-coord: $-b/2a$

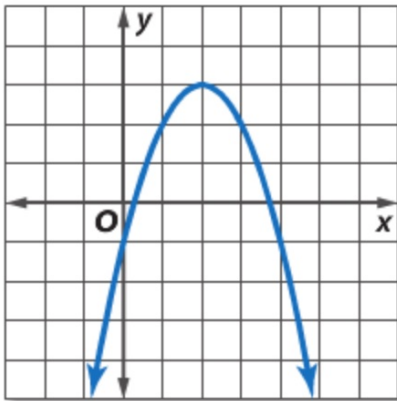


Example 2 Identify Characteristics from Graphs

Find the vertex, the equation of the axis of symmetry, and the y -intercept of each graph.



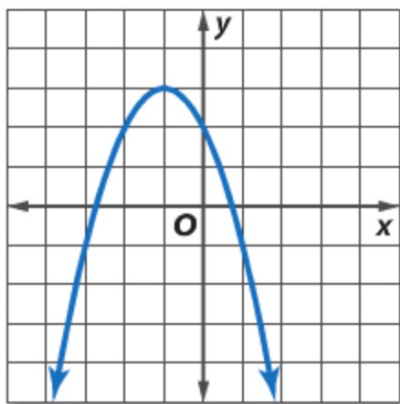
b.



vertex
axis of symmetry
y-intercept

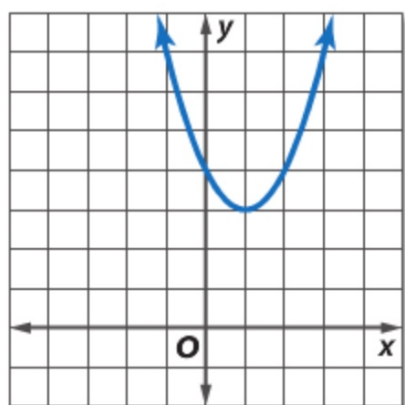
► **Guided Practice**

2A.



vertex
axis of symmetry
y-intercept
domain
range

2B.



$-b/2a$

Example 3 Identify Characteristics from Functions



Find the vertex, the equation of the axis of symmetry, and the y -intercept of each function.

a. $y = 2x^2 + 4x - 3$

$-b/2a$

b. $y = -x^2 + 6x + 4$

Guided Practice

3A. $y = -3x^2 + 6x - 5$

3B. $y = 2x^2 + 2x + 2$

Vertex

KeyConcept Maximum and Minimum Values

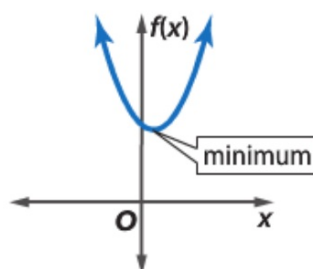
Words

The graph of $f(x) = ax^2 + bx + c$, where $a \neq 0$:

- opens upward and has a minimum value when $a > 0$, and
- opens downward and has a maximum value when $a < 0$.
- The range of a quadratic function is all real numbers greater than or equal to the minimum, or all real numbers less than or equal to the maximum.

Examples

a is positive.



a is negative.

