Algebra 1 9.1

Analyze characteristics of graphs of quadratic functions (x^2)

Graph quadratic functions

quadratic

standard form $y = x^2 + 5x + 6$

parabola - shape of quadr. graph

axis of symmetry

vertex

maximum - highest

minimum - lowest

table of values

x	y

giant graphs

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

$x^2 = x \cdot x$

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

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

$-5^2 = -1(5 \cdot 5) = -25$

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

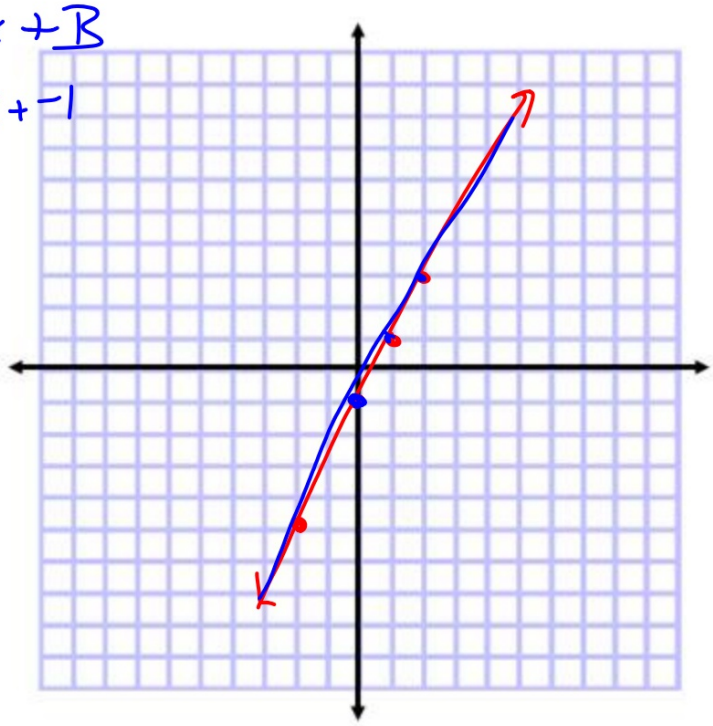
Giant graphs

$y = 2x - 1$

x	$2x-1$	
1	$2 \cdot 1 - 1$	1
-2	$2 \cdot -2 - 1$ $-4 + -1$	-5
2	$2 \cdot 2 - 1$	3
0	$2 \cdot 0 - 1$ $0 + -1$	-1

$y = mx + B$

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



$y = x^2$

min.

Vertex? $(0,0)$

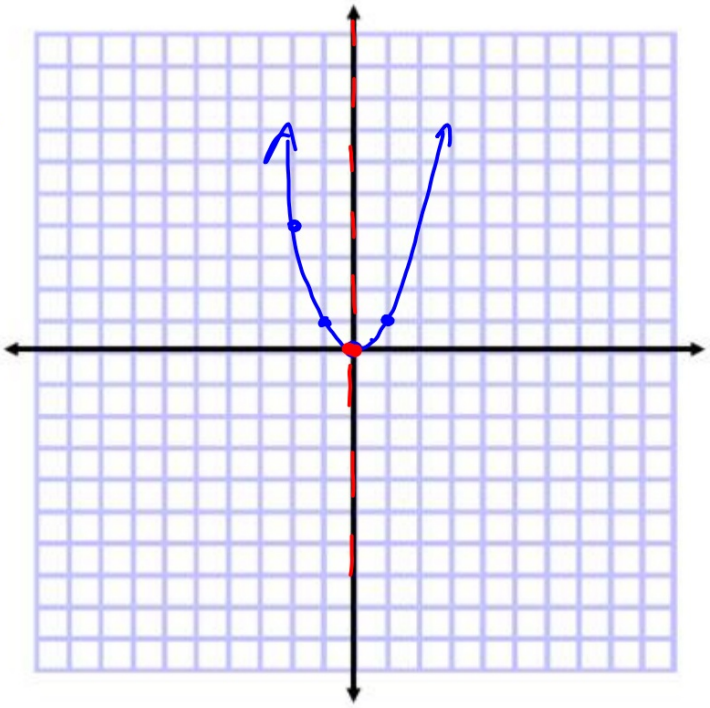
Axis of symmetry? $x = 0$

domain? $y = x^2$ ARN

range? $y \geq 0$

$x \cdot x$

x	$x^2 = x \cdot x$	y
0	$0 \cdot 0$	0
5	$5 \cdot 5$	25
1	$1 \cdot 1$	1
-2	$-2 \cdot -2$	4
-1	$-1 \cdot -1$	1
$\frac{1}{2}$	$\frac{1}{2} \cdot \frac{1}{2}$	$\frac{1}{4}$



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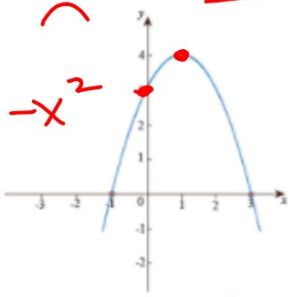
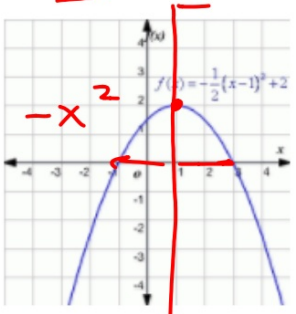
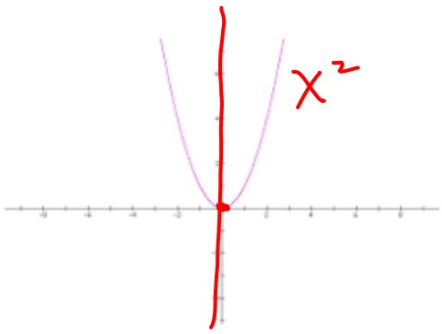
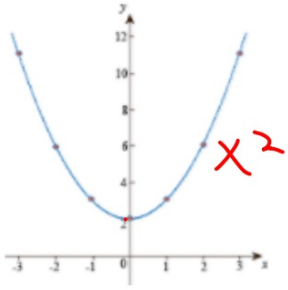
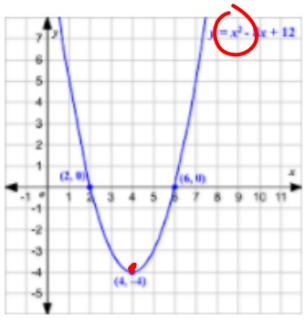
$0x^2 + 0x + 3$

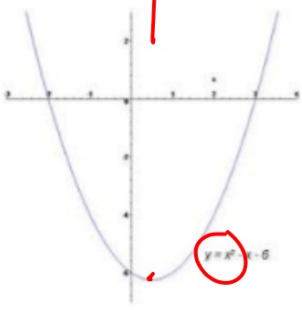


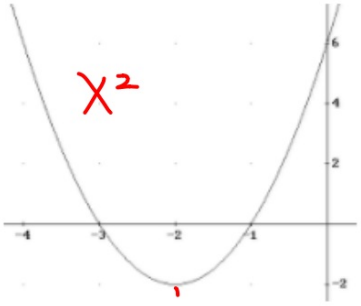


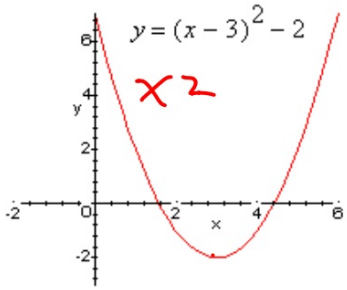






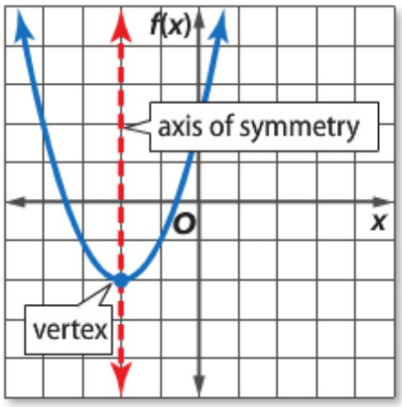






KeyConcept Quadratic Functions

Parent Function:	$f(x) = x^2$
Standard Form:	$f(x) = ax^2 + bx + c$
Type of Graph:	parabola
Axis of Symmetry:	$x = -\frac{b}{2a}$
***y*-intercept:**	c



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

Vertex? (2, 0)

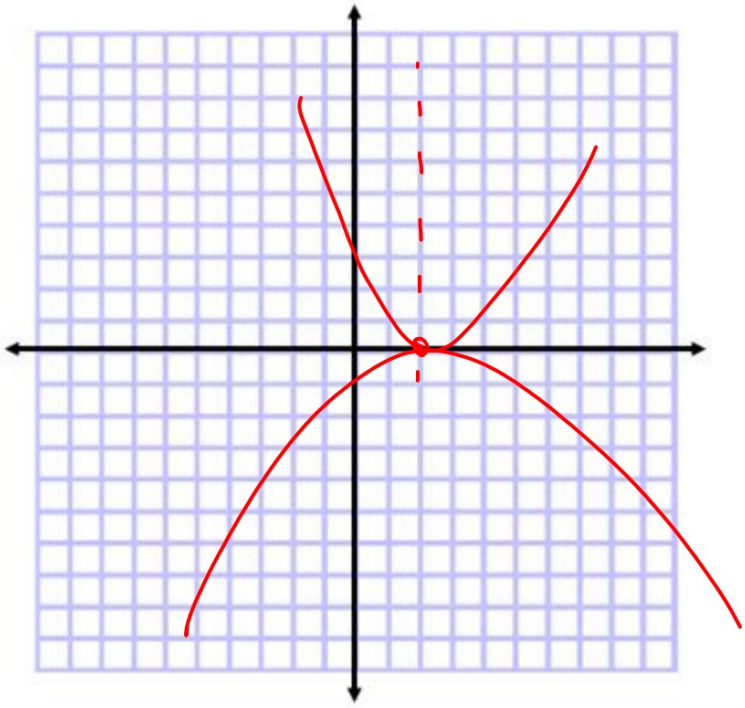
Axis of symmetry? $x = 2$

(parent graph)

domain?

range?

-3
-2
-1
0
1
2
3



Giant graphs

GuidedPractice

$y = ax^2 + bx + c$

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

A.O.S. $x = -1$

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

$y = 1x^2 + 2x - 6$

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

x-coord of vertex

	x^2+2x-6
-1	$-1 \cdot -1 + 2 \cdot -1 + -6$ $1 + -2 + -6$
0	
1	
2	
-2	
-3	
-4	

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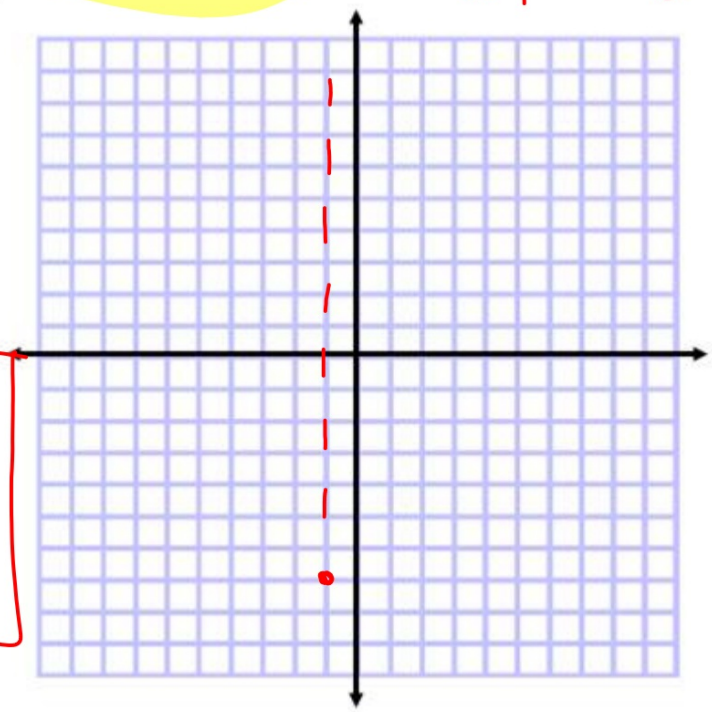
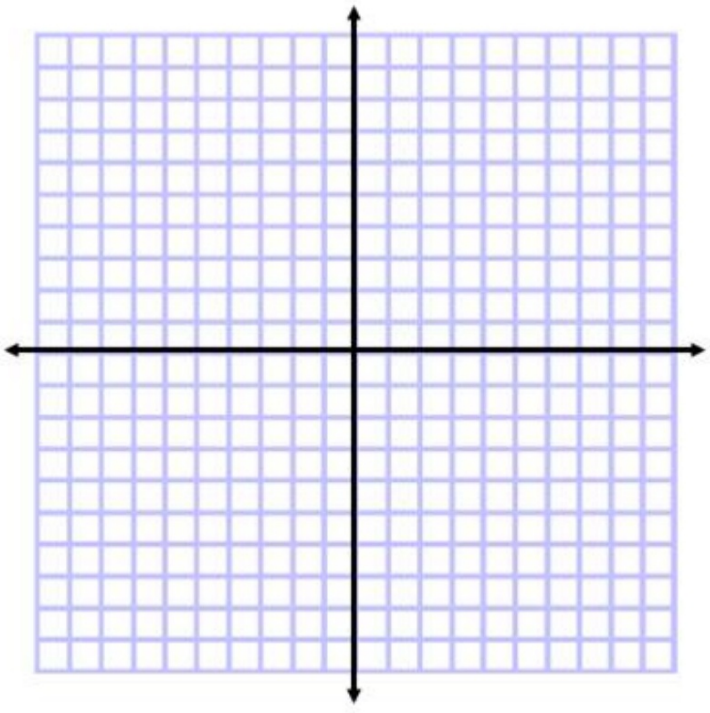


Example 1 Graph a Parabola

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

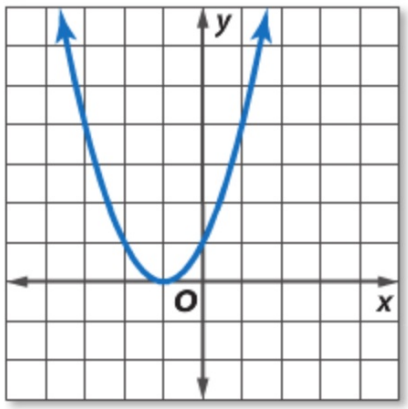


x-coord: -b/2a

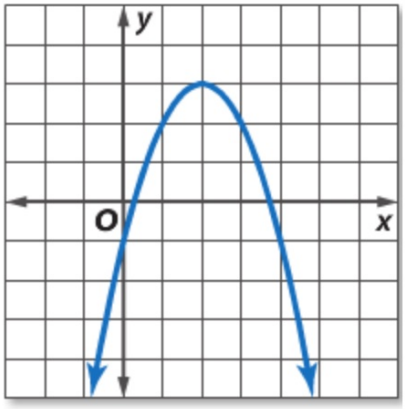
Example 2 Identify Characteristics from Graphs

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

a.



b.

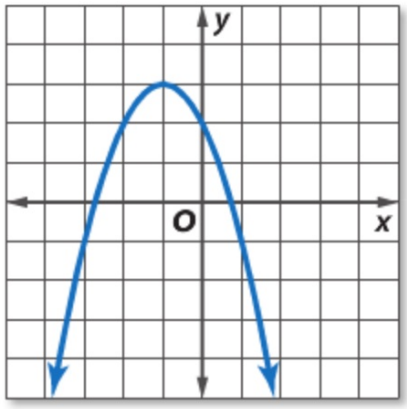


vertex
axis of symmetry
y-intercept

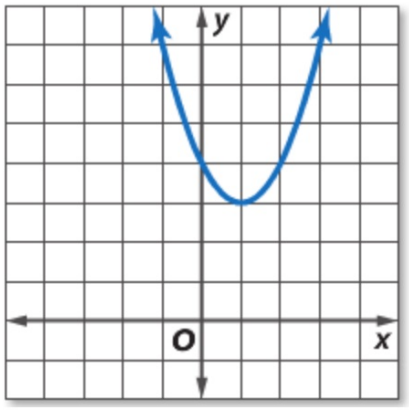
vertex
axis of symmetry
y-intercept
domain
range

Guided Practice

2A.



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

GuidedPractice

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

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

Vertex

KeyConcept Maximum and Minimum Values

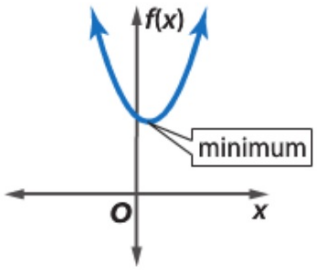
Words

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

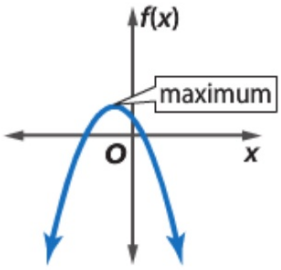
- opens upward and has a minimum value when $a > 0$, and
- opens downward and has a maximum value when $a < 0$.
- The range of a quadratic function is all real numbers greater than or equal to the minimum, or all real numbers less than or equal to the maximum.

Examples

a is positive.



a is negative.



....vertex

Example 4 Maximum and Minimum Values

Consider $f(x) = -2x^2 - 4x + 6$.

a. Determine whether the function has a *maximum* or *minimum* value.

b. State the maximum or minimum value of the function.

c. State the domain and range of the function.