Algebra 1 9.1

Analyze characteristics of graphs of quadratic functions

Graph quadratic functions

axis of symmetry $\frac{-b}{2a}$ $\frac{-5}{2}$

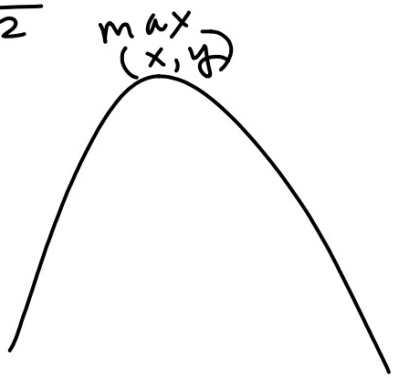
vertex

maximum

minimum

standard form

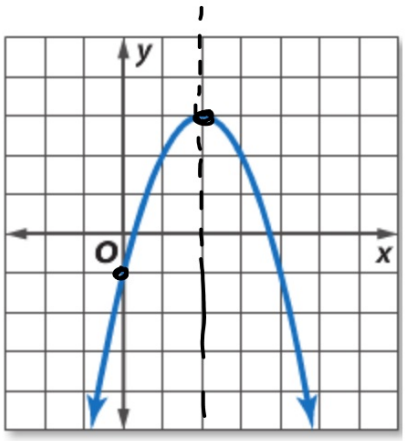
whiteboards



$y = 1x^2 + 5x - 3$

max or min?

b.



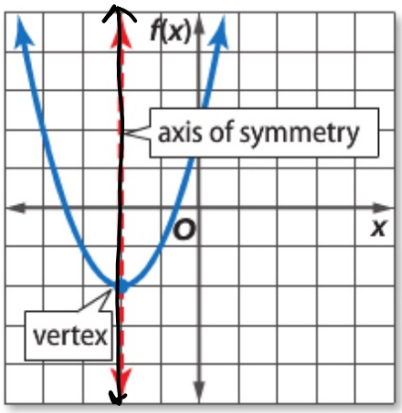
max
(2, 3)

$x = 2$ (AOS)

(0, -1) y-int

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



KeyConcept Maximum and Minimum Values

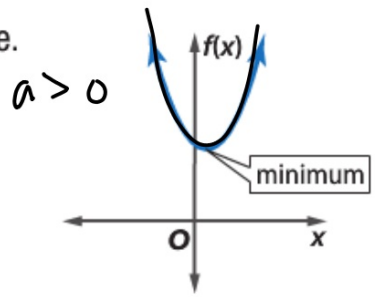
Words

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

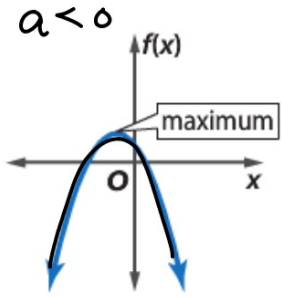
- opens upward and has a minimum value when $a > 0$, and
- opens downward and has a maximum value when $a < 0$.
- The range of a quadratic function is all real numbers greater than or equal to the minimum, or all real numbers less than or equal to the maximum.

Examples

a is positive.



a is negative.



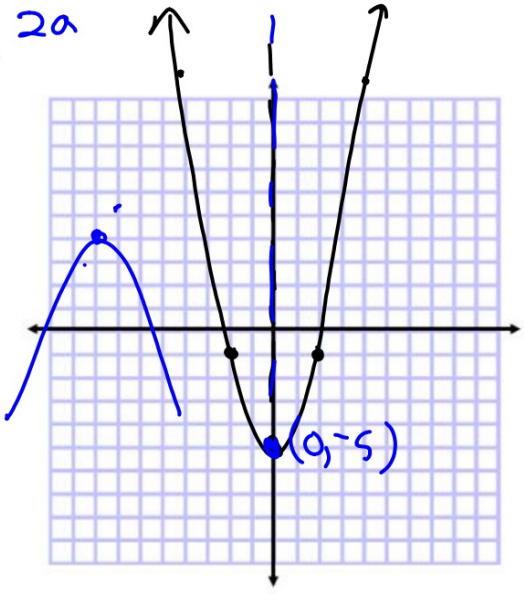
Use a table of values to graph

4. $y = |x^2 - 5$

Work smarter, not harder...

AOS = $\frac{0}{2 \cdot 1}$

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



$x^2 - 5$

0	0.0 - 5	-5
2	2.2 - 5	-1
4	4.4 - 5	11
-2	x·x -2·-2 - 5	-1
-4	-4·-4 - 5	11

D: ARN

R: $y \geq -5$

$2x^2 + 6x - 8$

$2(x^2 + 3x - 4)$

$\frac{-6}{2 \cdot 2} = -\frac{6}{4} = -1.5$

$y = 3x^2 + 12x + 5$

$\frac{-12}{3 \cdot 2} = \frac{-12}{6} = -2$

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

Vertex =

A.O.S. $= \frac{-4}{2} = -2$

y-int. $(0, -3)$

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

-2	$4 + -8 + -3$	-7
0	$0 + 0 - 3$	-3

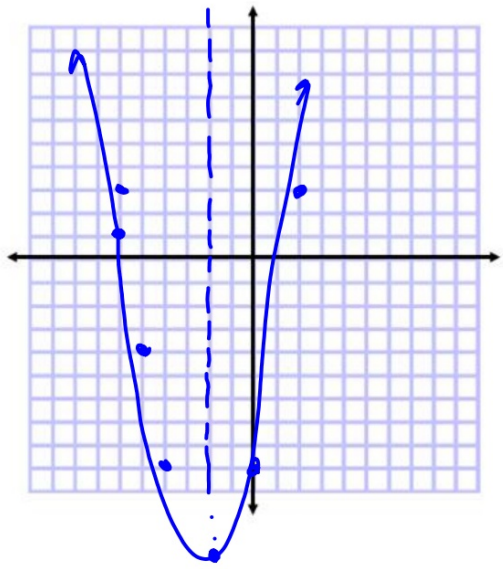
AOS $x = -2$

$V(-2, -7)$

6. $y = x^2 + 4x - 9$

a b c

AOS $x = \frac{-4}{2 \cdot 1} = \frac{-2}{1}$



x·x

	x^2+4x-9	
-2	$4+-8-9$	-13
0	$0+0-9$	-9
2	$4+8-9$	3
-5	$25+-20+-9$	-4
-4	$16+-16-9$	-9
-6	$36+-24-9$	3

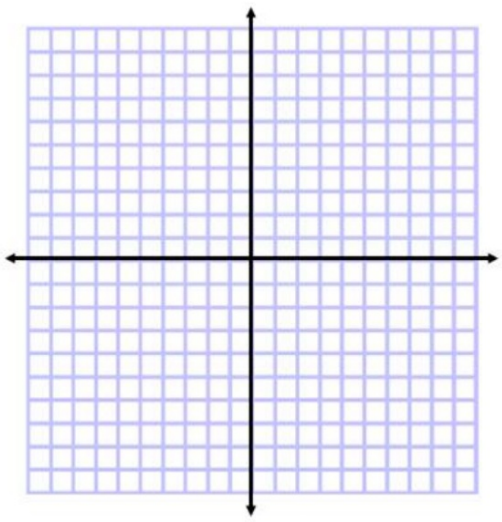
$y = x^2 - 4x + 3$

$\frac{4}{2}$

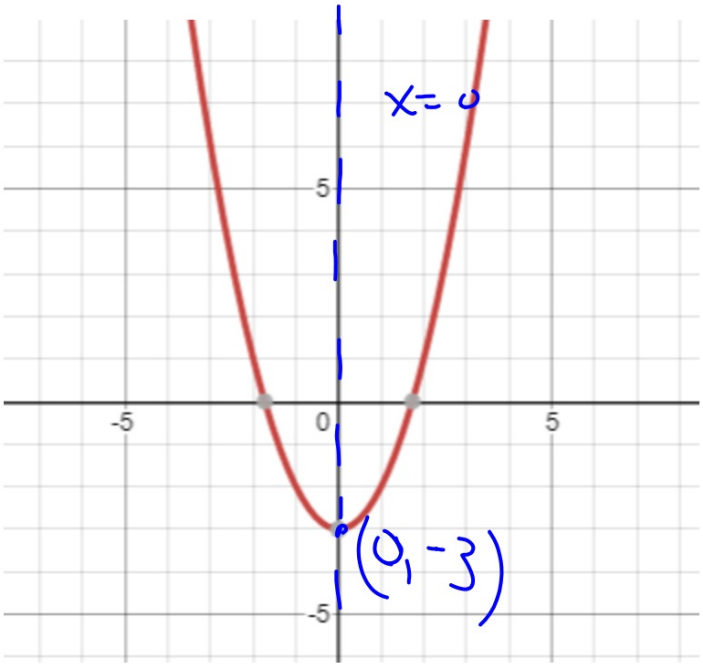
AoS $x = 2$

vertex $(2, -1)$

y-int $(0, 3)$



	$x^2 - 4x$	
2	$4 - 4 \cdot 2 + 3$	-1
	$4 - 8 + 3$	



Max/Min (vertex) coordinates:

Y-int (0, -3)

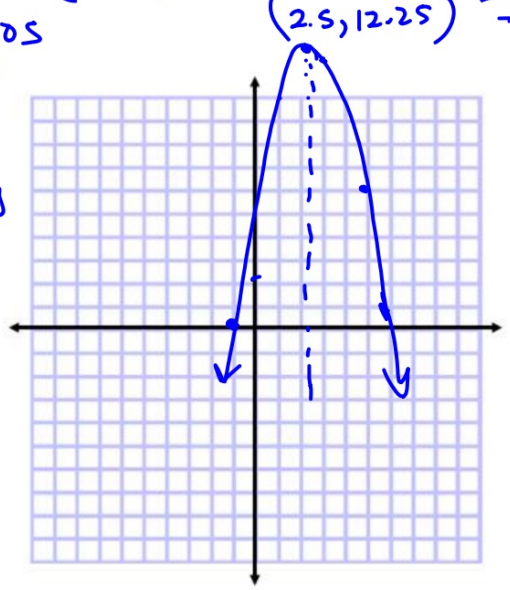
7. $y = -x^2 + 5x + 6$

AOS $x = 2.5$

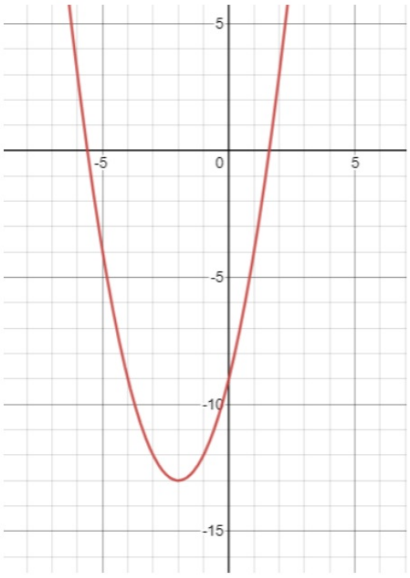
$$x = \left(\frac{-5}{2 \cdot -1}\right) = \left(\frac{-5}{-2}\right)$$

a pos

a neg



	$1x^2 + 5 \cdot x + 6$	
2.5	$-6.25 + 12.5 + 6$	12.25
3	$-1 \cdot 9 + 5 \cdot 3 + 6$	12
5	$-1 \cdot 55 + 5 \cdot 5 + 6$	6
-1	$-1 \cdot -1 \cdot -1 + 5 \cdot -1 + 6$	0
	$-1 \quad -5 + 6$	
1	$-1 \cdot 1 \cdot 1 + 5 \cdot 1 + 6$	



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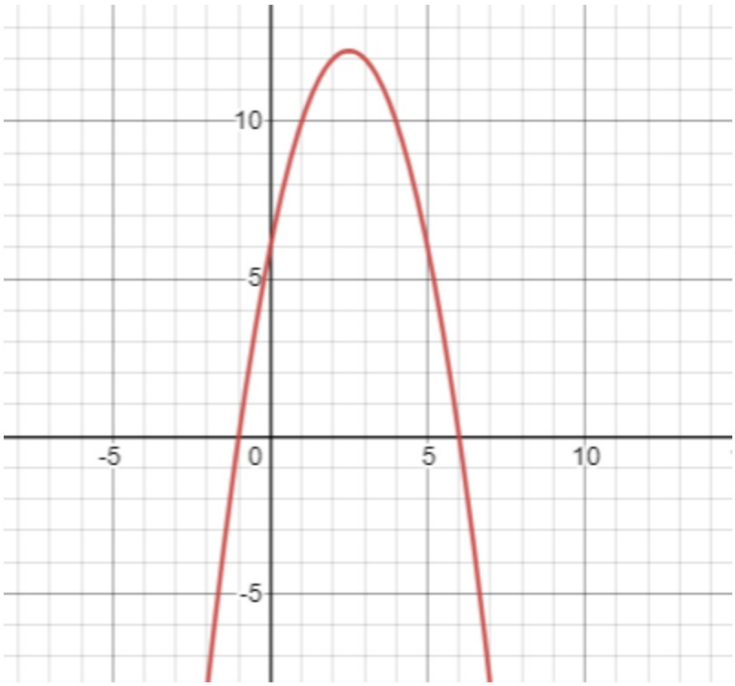
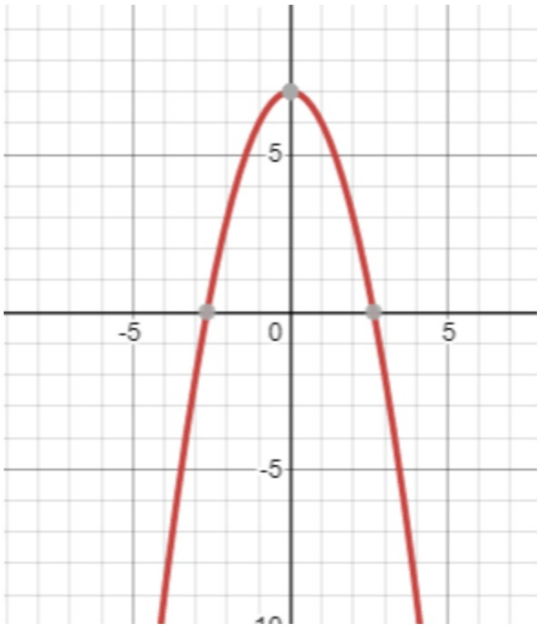

10
5
-5
0
5
10
-5


5
-5
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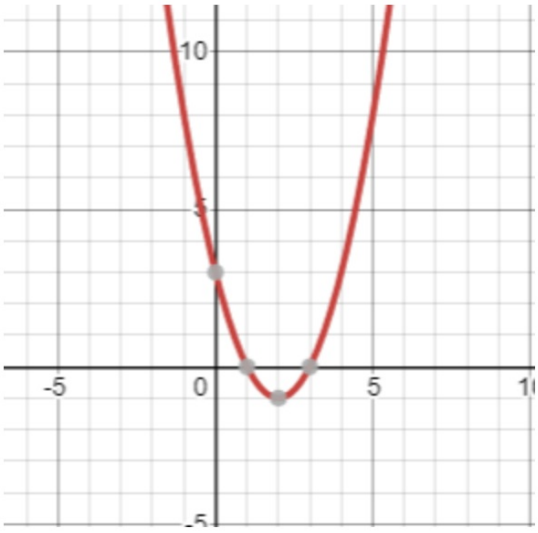
10
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