Algebra 1 9.1

Analyze characteristics of graphs of quadratic functions

Graph quadratic functions

axis of symmetry

vertex

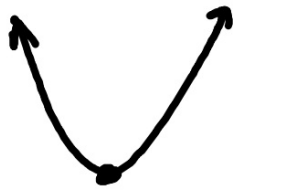
maximum

minimum

standard form

whiteboards

x^2 ...



minimum

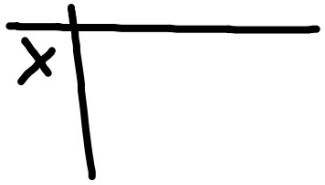
( )

maximum

( )

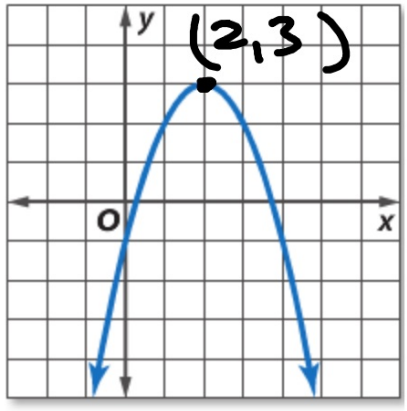
$y = ax^2 + bx + c$

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



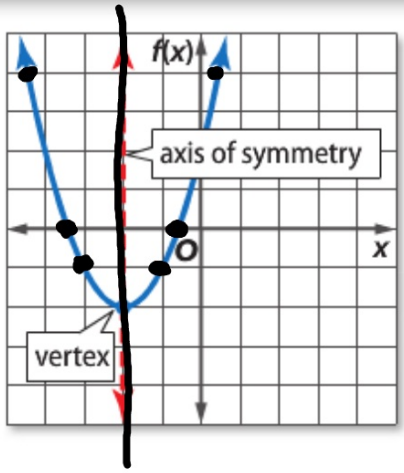
max or min?

b. max



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

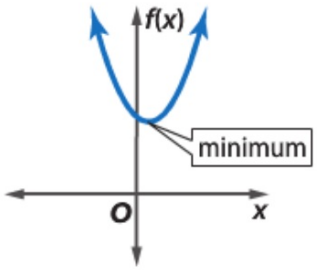
Words

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

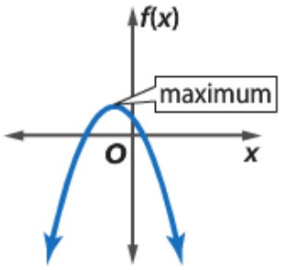
- opens upward and has a minimum value when $a > 0$, and
- opens downward and has a maximum value when $a < 0$.
- The range of a quadratic function is all real numbers greater than or equal to the minimum, or all real numbers less than or equal to the maximum.

Examples

a is positive.



a is negative.



Use a table of values to graph

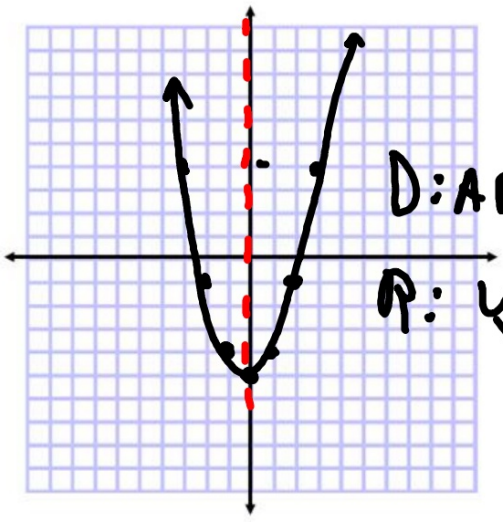
4. $y = x^2 - 5$

$y = ax^2 + bx + c$

$a = 1 \quad b = 0 \quad c = -5$

$x = \frac{-b}{2 \cdot a} = \frac{0}{2 \cdot 1} = \frac{0}{2} = 0$

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



D: ARN

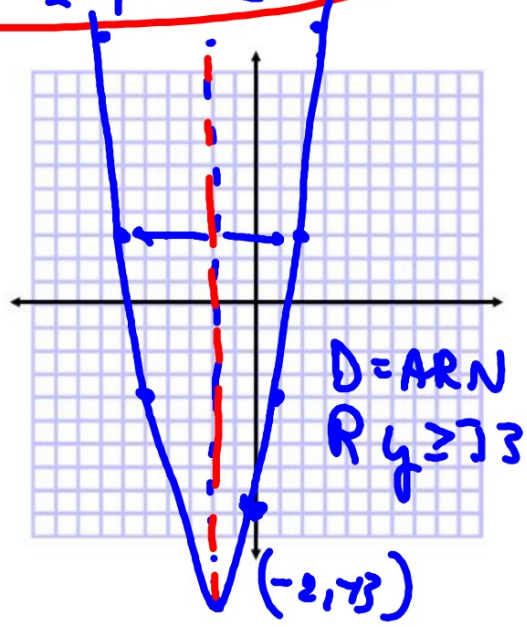
R: $y \geq -5$

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

$a=1 \quad b=4 \quad c=-9$

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

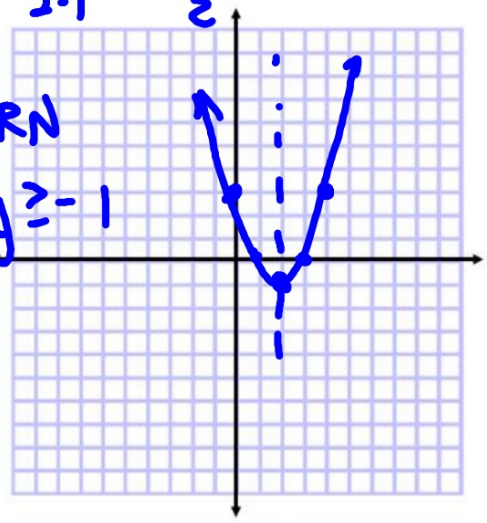
$x \cdot *$	$x^2 + 4x - 9$	
-2	$-2 \cdot -2 + 4 \cdot -2 + 9$	-13
2	$2 \cdot 2 + 4 \cdot 2 - 9$	3
1	$1 \cdot 1 + 4 \cdot 1 - 9$	-4
3	$3 \cdot 3 + 4 \cdot 3 - 9$	12



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

$a=1 \quad b=-4 \quad c=3$

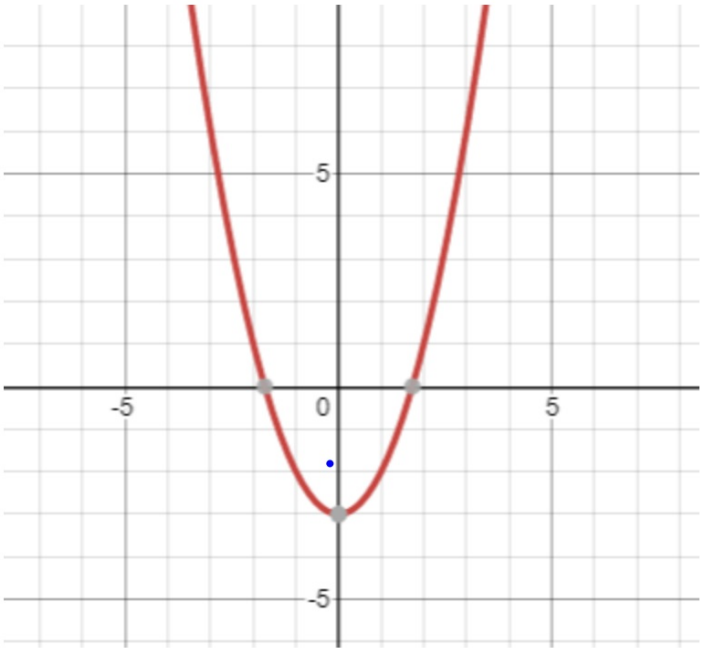
$x=\frac{4}{2\cdot 1}=\frac{4}{2}=2$



D: ARN

R: $y \geq -1$

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



Max/Min (vertex) coordinates:

(0, -3)

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

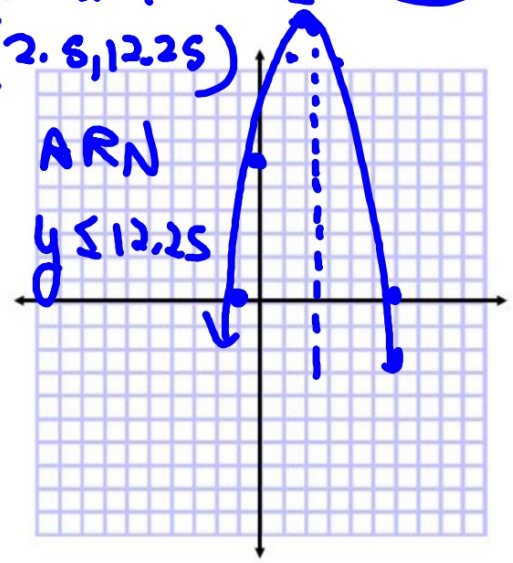
$a=-1 \quad b=5 \quad c=6$

$x = \frac{-5}{2 \cdot -1} = \frac{-5}{-2} = 2.5$

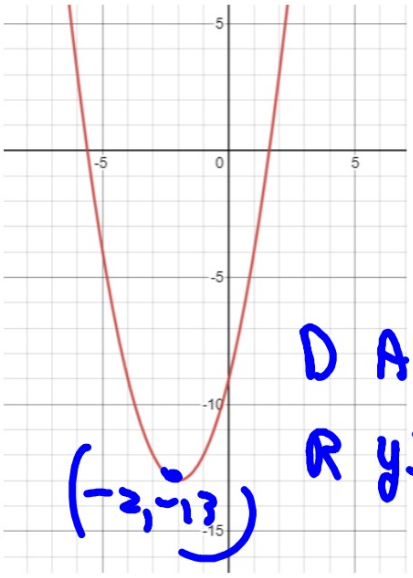
$(2.5, 12.25)$

D ARN

R $y \leq 12.25$

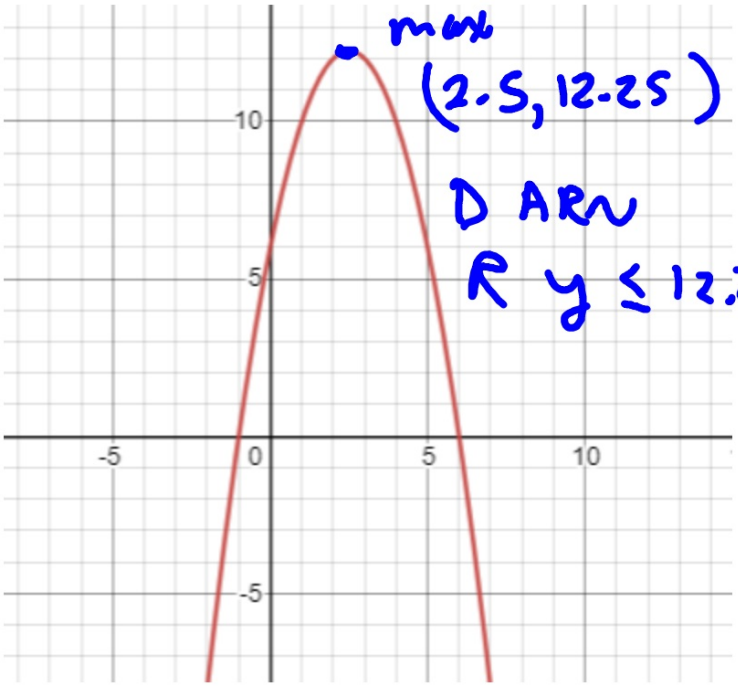


2.5	$-1 \cdot 2.5 \cdot 2.5 + 5 \cdot 2.5 + 6$	
	$-6.25 + 12.5 + 6$	12.25
3.5	$-1 \cdot 3.5 \cdot 3.5 + 5 \cdot 3.5 + 6$	
	$-12.25 + 17.5 + 6$	11.25
-1	$-1 \cdot -1 \cdot -1 + 5 \cdot -1 + 6$	
	$-1 + -5 + 6$	0



D AR N

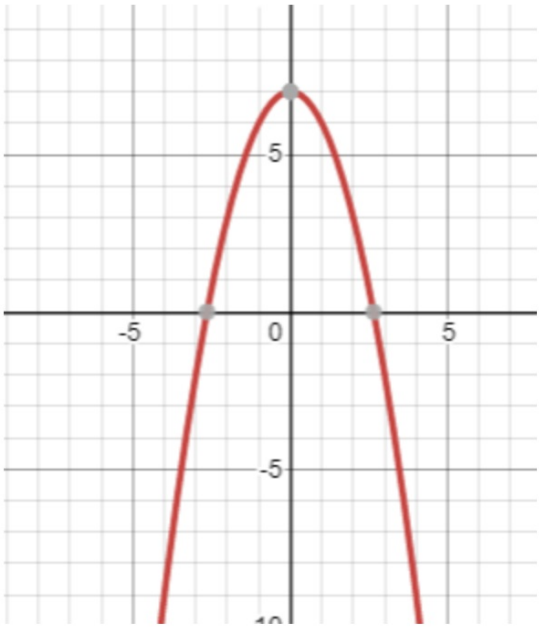
R $y \geq -13$

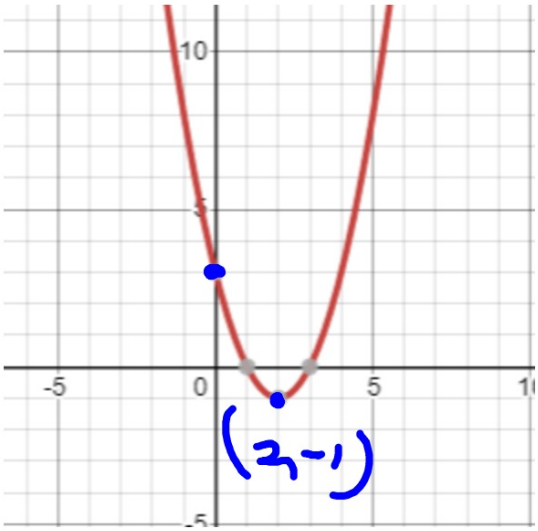


max
(2.5, 12.25)

D ARN

R $y \leq 12.25$


5
-5
0
5
-5



D ARN
R y≥-1

1. $x = -\frac{b}{2a}$ (vertex / TOV / AOS $x =$)

2. graph

3. D R
   ↓ ↓
   ARN vertex

4. c = y int

5. max/min