Name: Key
8A; Algebra 1

Date _____
Period _____

How Do We Graph A Quadratic Equation?

parabola

The graph of a **quadratic equation** that has the form $y = ax^2 + bx + c$, where a, b, and c stand for numbers, and $a \neq 0$, is called a **parabola**.

Examples:

1) (a) Graph the equation $y = x^2 - 4x + 3$ for all values of x such that $-1 \leq x \leq 5$.

(opens up/min)

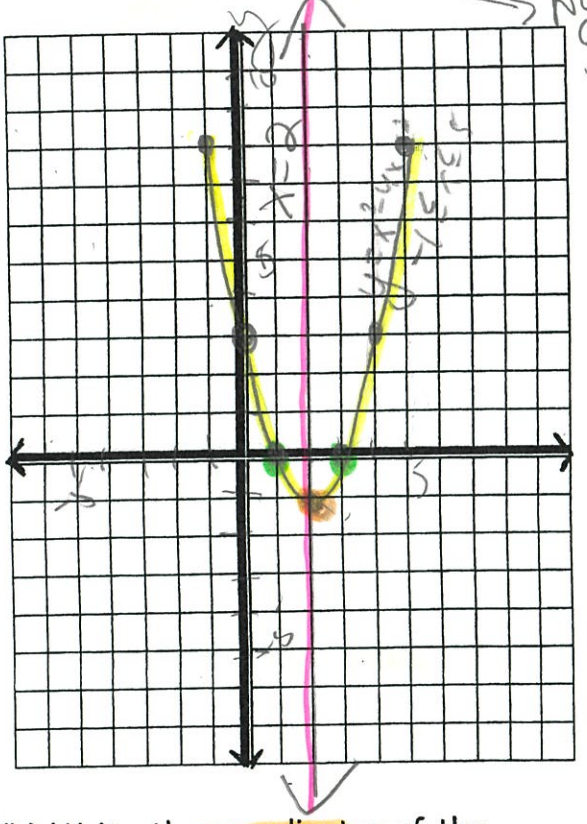
Domain • interval • constraint

No arrow b/c of constraint given

x		y	
-1		8	
0		3	
1		0	
2		-1	
3		0	
4		3	
5		8	

symmetry

vertex OR turning point



(b) Write the coordinates of the turning point. (2, -1)

↳ aka vertex

(c) Write the equation of the axis of symmetry. $x = 2$

vertical line that goes through the turning point

Will Always match

End Behavior: Domain: $-1 \leq x \leq 5$ OR $[-1, 5]$

Range: $-1 \leq y \leq 8$ OR $[-1, 8]$

(d) Write the x – intercepts. (Roots, zeros, solutions)

$x = 1$ and $x = 3$ (where $y = 0$)

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

$x^2 - 4x + 3 = 0$

$(x - 3)(x - 1) = 0$

$x = 3 \quad / \quad x = 1$

2 Real Roots

$b^2 - 4ac$

$(-4)^2 - 4(1)(3)$

Rational

Positive discriminant

Constraint Domain

***When no interval is given, you must find the turning point.** You may use your calculator to do this.

Example 2:

Sketch the graph of $y = -x^2 + 4x - 4$

$ax^2 + bx + c$

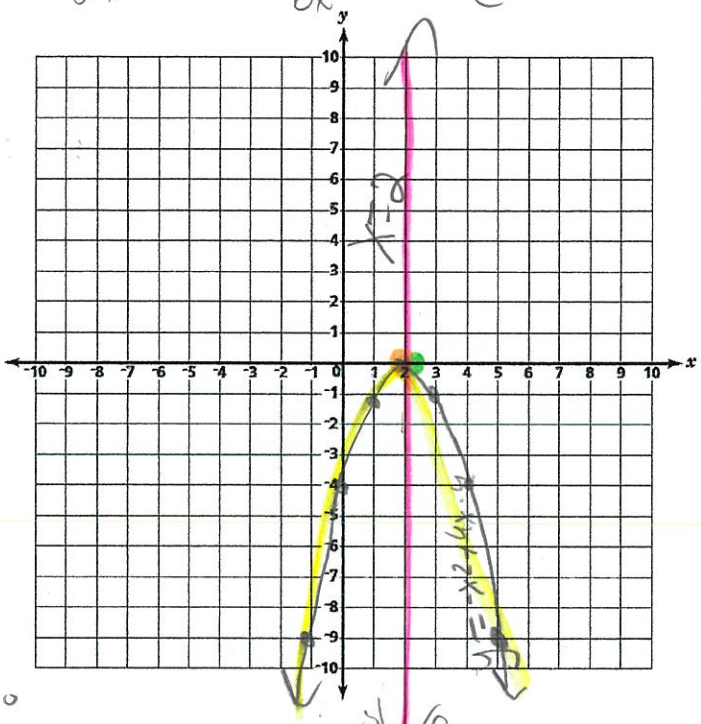
$-x^2$ (over down (max)) — Reflection over the x-axis

$a = \frac{-1}{ax^2}$ $b = \frac{4}{bx}$ $c = \frac{-4}{c}$

x	y
-1	-9
0	-4
1	-1
2	0
3	-1
4	-4
5	-9

* when no constraints you copy as many coordinates as you can graph

Vertex Turning Point



Turning Point

Vertex: (2, 0)

Axis of symmetry

AOS: $x = 2$

x-intercepts ($y = 0$)

Roots: $x = 2$ (1 real rational root)

$b^2 - 4ac$

$(4)^2 - 4(-1)(-4)$

$16 - 16 = 0$ Discriminant = 0

Opens: Down B/C of $-x^2$

End behavior: Domain: All reals or $(-\infty, \infty)$ or $\mathbb{R}$ * arrows B/C no constraint given

Range: $y \leq 0$ OR $(-\infty, 0]$

Example 3:

Sketch the graph of $y = -x^2 - 1$ by filling in the table below

$a = \frac{-1}{ax^2}$ $b = \frac{0}{bx}$ $c = \frac{-1}{c}$

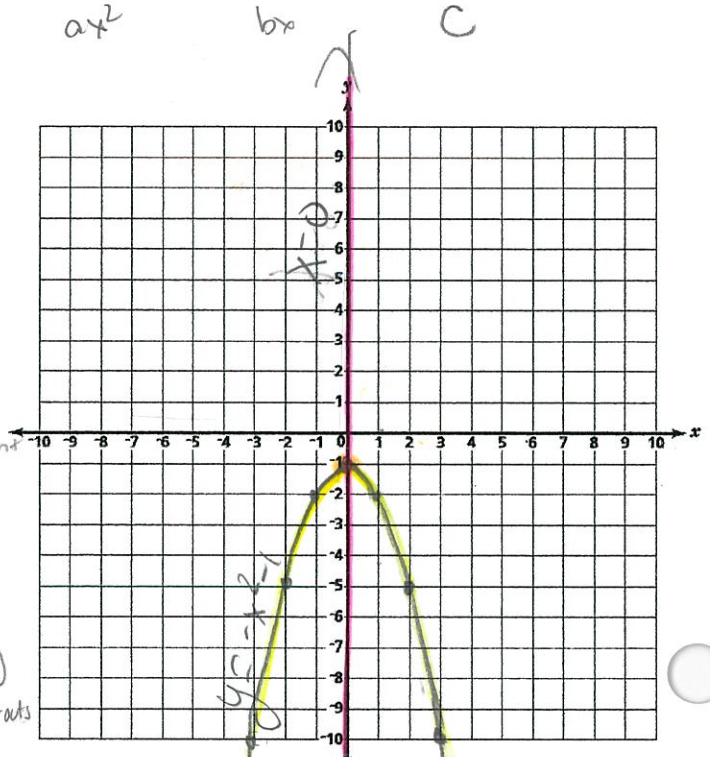
opens down (max)

- Reflection over the x-axis

x	-3	-2	-1	0	1	2	3
y	-10	-5	-2	-1	-2	-5	-10

* Copy as many coordinates as you can graph when there are no constraints!

Vertex T.P.



Turning point

Vertex: (0, -1)

* Negative Discriminant

$b^2 - 4ac$

$(0)^2 - 4(-1)(-1)$

$0 - 4 = -4$

Axis of symmetry

AOS: $x = 0$ (y-axis)

x-intercept

Roots: No real roots (ex: $\sqrt{-4}$; imaginary) OR 2 complex/imaginary roots

Opens: Down B/C of $-x^2$

End behavior:

Domain: All reals or $(-\infty, \infty)$ or $\mathbb{R}$ * arrows B/C no constraint given

Range: $y \leq -1$ or $(-\infty, -1]$