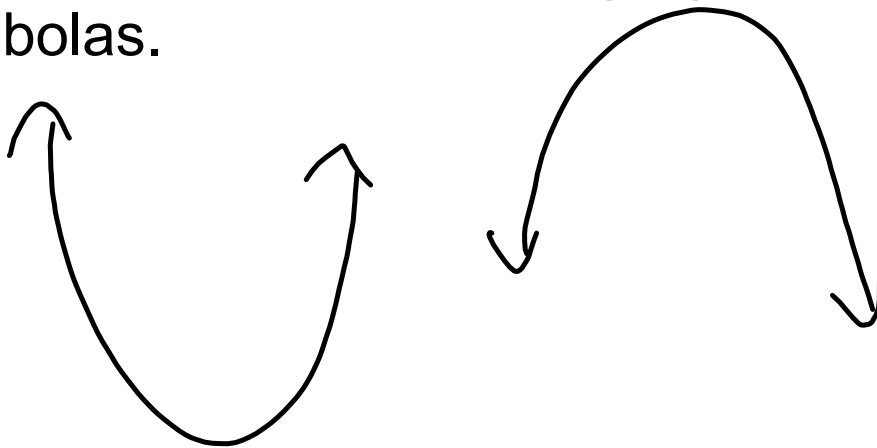
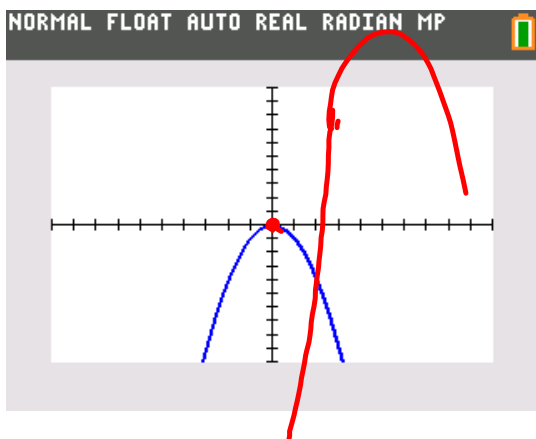
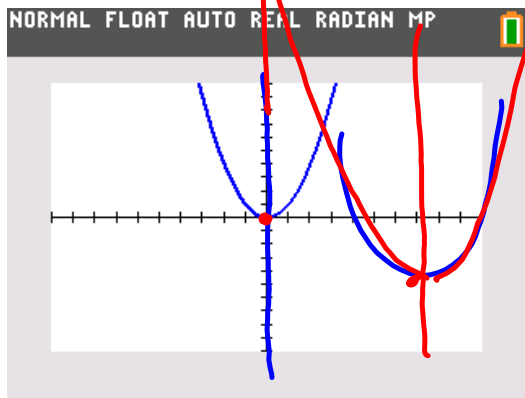


Chapter 9 Day 1:

Today we will learn how to graph a parabola and also how to determine properties of parabolas.



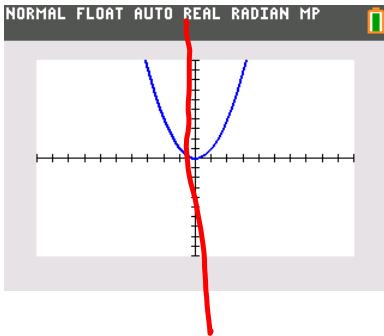
$$y = \cancel{ax^2} + bx + c$$



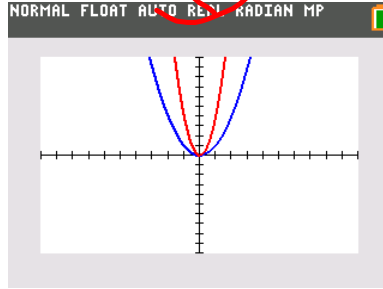
Vocabulary:

- ✓ -coefficients
- ✓ -axis of symmetry
- ✓ -vertex
- ✓ -y-intercept
- ✓ -domain
- ✓ -range
- ✓ -minimum
- ✓ -maximum

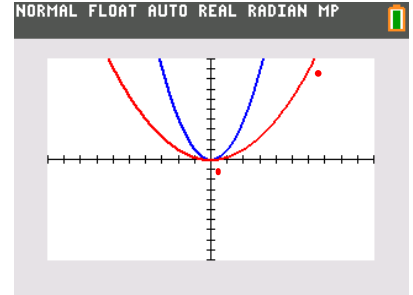
$$y = x^2$$



$$y = 4x^2$$



$$y = \frac{1}{4}x^2$$



$$y = ax^2 + bx + c$$

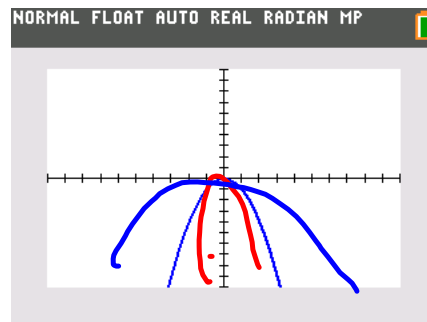


if $|a| > 1$ the graph gets skinnier
if $0 < |a| < 1$ the graph gets fatter

What if a is negative?

$$y = -x^2$$

$$y = -\frac{1}{4}x^2$$



Standard Form of a Quadratic (Parabola)

$$y = ax^2 + bx + c$$

The following steps will take you through the problem:

1. Identify a, b, and c
2. Find the axis of symmetry
3. Start a table of values using your x value from step 2
4. Identify your vertex (using steps 2 & 3)
5. Identify your y-intercept (0,c)
6. Plot your vertex, y-intercept and your axis of symmetry on your graph
7. Choose at least one more x-value to add to your table of values, then plot this point.
8. Connect your points to form your parabola.

Ex: $y = x^2 + 2x + 1$

$a = 1$

$b = 2$

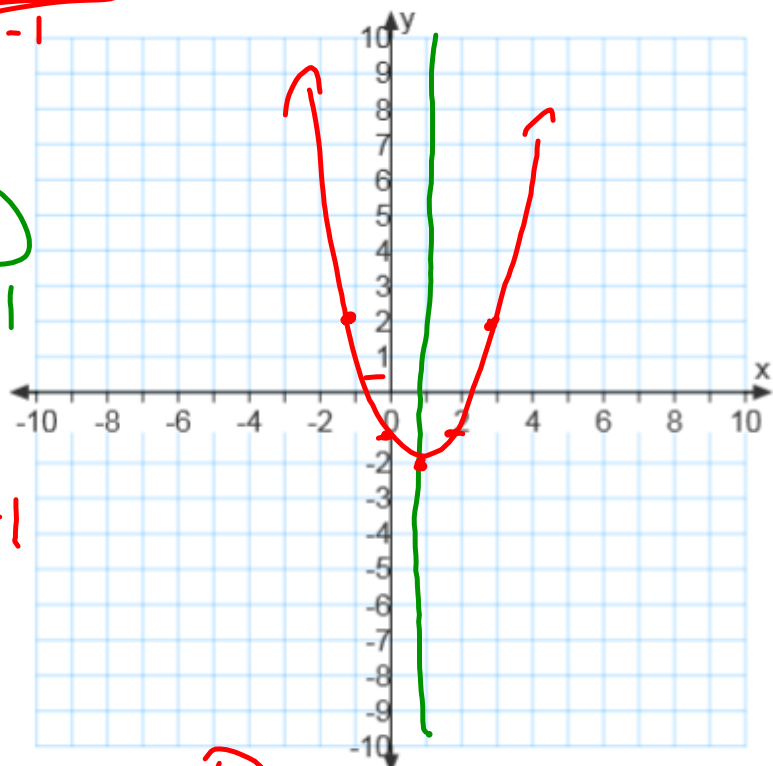
$c = 1$

axis of symmetry

$$x = \frac{-b}{2a} = \frac{-2}{2(1)} = \frac{-2}{2} = -1$$

Vertex $(-1, -2)$

X	Y
1	-2
0	-1
2	1
3	



domain: $\mathbb{R}$

range: $y \geq -2$

minimum or maximum?

Example: $y = 2x^2 + 8x + 6$

$a = 2$

$b = -8$

$c = 6$

$c = 6$

axis of symmetry

$x = \frac{-b}{2a} = \frac{-(-8)}{2(2)} = \frac{8}{4} = 2$

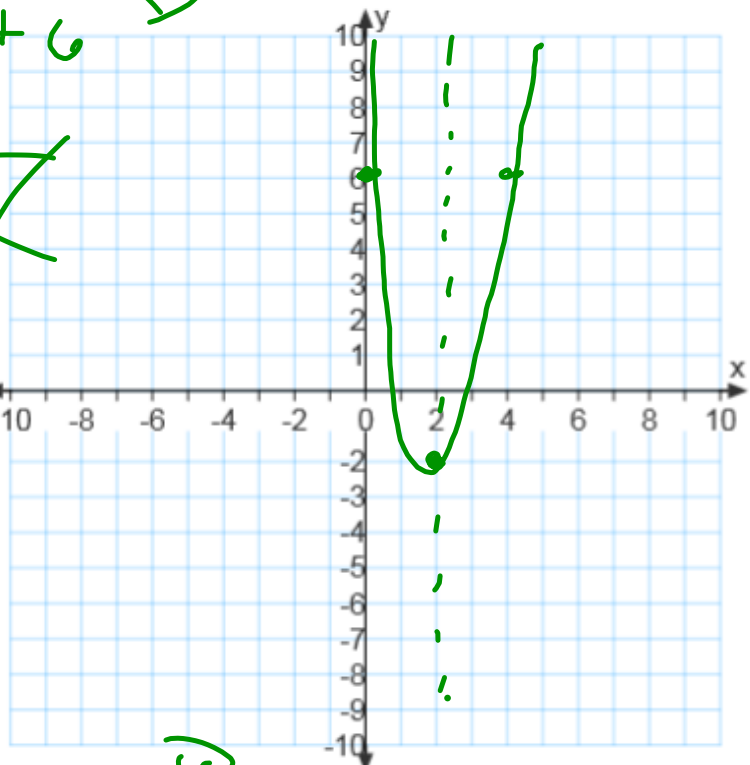
Vertex $(2, -2)$

X	Y
2	-2
0	6
4	6

domain: $\mathbb{R}$

range: $y \geq -2$

minimum or maximum?



Example: $f(x) = -x^2 - 3x + 10$

$a = -1$
 $b = -3$
 $c = 10$

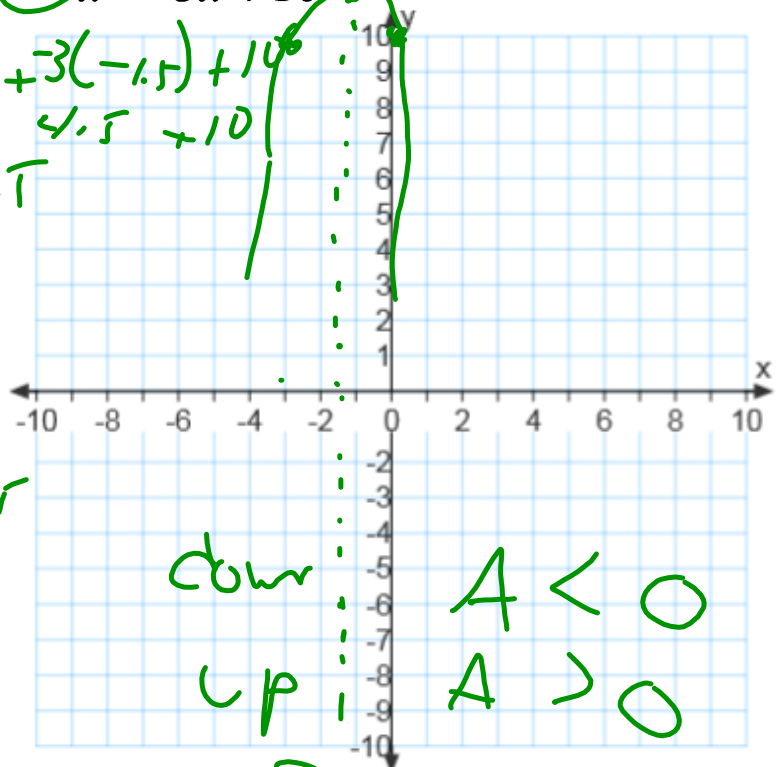
$-(-1.5)^2 + 3(-1.5) + 10$
 $-2.25 + 4.5 + 10$
 17.25

axis of symme

$$x = \frac{-b}{2a} = \frac{-(-3)}{2(-1)} = -\frac{3}{2}$$

Vertex $(-1.5, 17.25)$

X	Y
-1.5	17.25
0	10
-3	10



domain: $\mathbb{R}$

range: $y \leq 17.25$

minimum or maximum?

Example: $y = \frac{1}{4}x^2 + 0x + 0$

$a = \frac{1}{4}$

$b = 0$

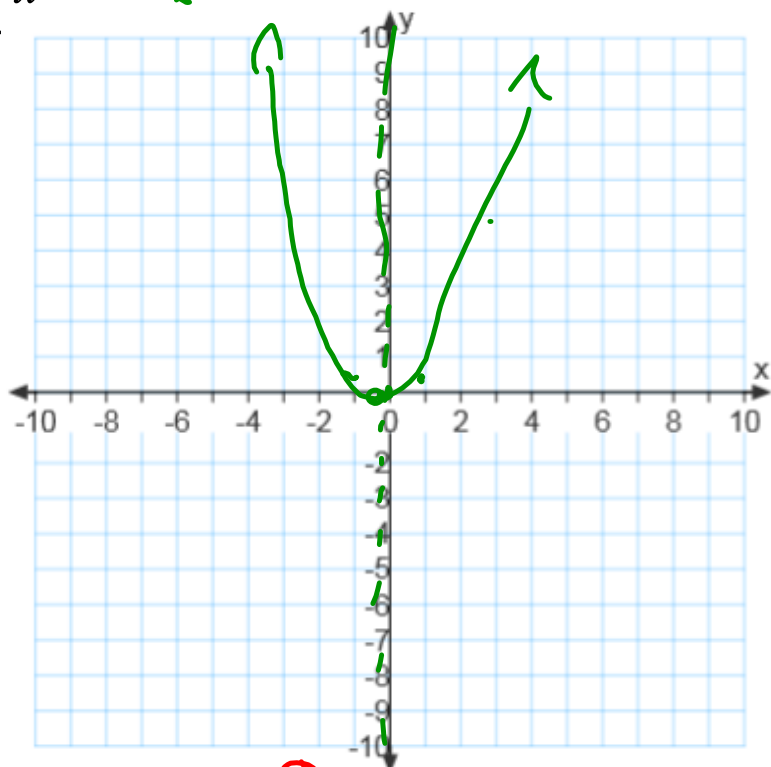
$c = 0$

axis of symme

$x = \frac{-b}{2a} = \frac{-0}{2(\frac{1}{4})} = 0$

Vertex $(0, 0)$

X	Y
0	0
1	.25
-1	.25

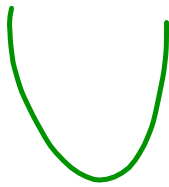


domain: $\mathbb{R}$

range: $y \geq 0$

minimum or maximum?

Example: Determine whether the function
 $y = 3x^2 - 18x + 20$
 has a minimum value or a maximum value.
 Then, find the minimum or maximum value.



$$\begin{aligned} A &= 3 \\ B &= -18 \\ C &= 20 \end{aligned}$$

$$X = \frac{-B}{2A} = \frac{-(-18)}{2 \cdot 3} = \frac{18}{6} = 3$$

$$(3, -7)$$

$$\text{Min val} = -7$$

