

$$f(x) = ax^2 + bx + c$$

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

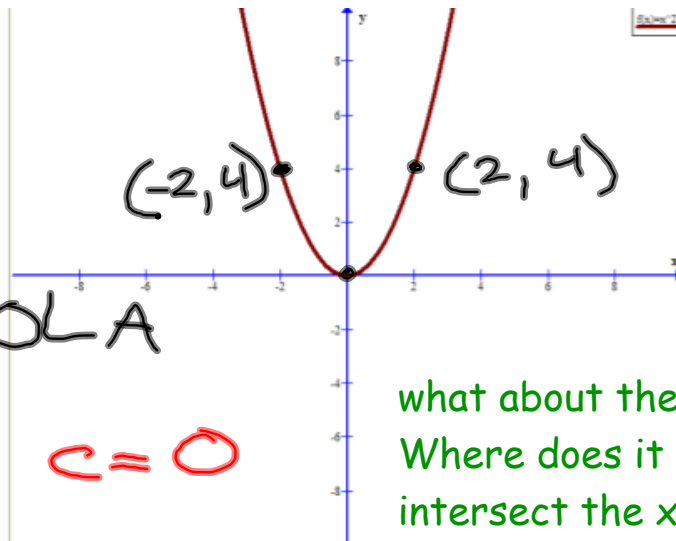
$$y = x^2$$

PARABOLA

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

$$D = b^2 - 4ac$$

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

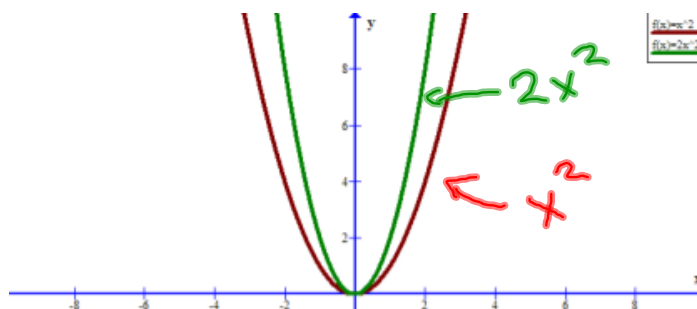


what about the x-axis?
Where does it
intersect the x-axis?

it intersects at (0,0)

$$y=2x^2$$

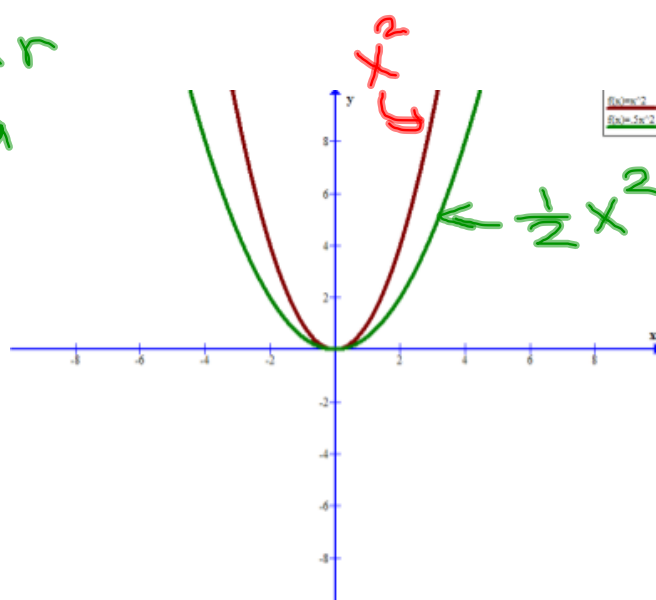
What changed?



- each y-value doubled
- it got narrower.
- Still crossing x-axis at same place.

If I wanted to make the graph wider, how could I do it?

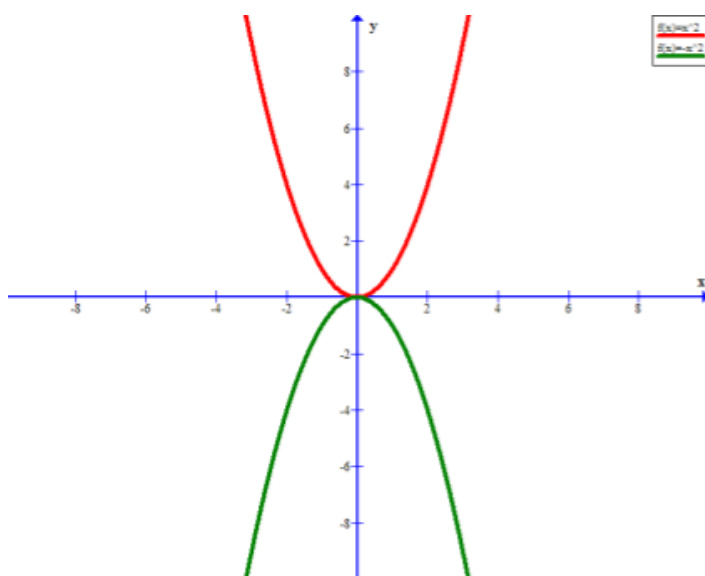
by making our coefficient a fraction!



What happens if a is negative?

$$y=-x^2$$

Predictions: it flips into 3rd and 4th quadrant instead of 1st and 2nd.

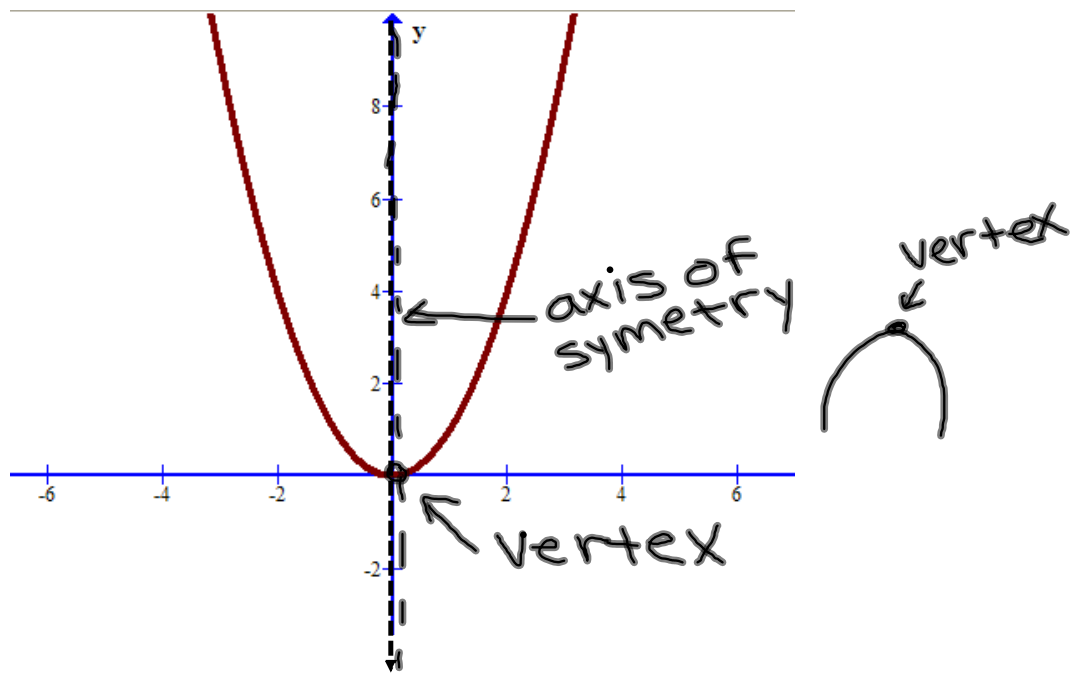


$$y = \frac{1}{4}x^2$$

- wider than x^2
- opens up
- vertex at (0,0)

$$y = -2x^2$$

- narrower than x^2
- opens down
- vertex at (0,0)



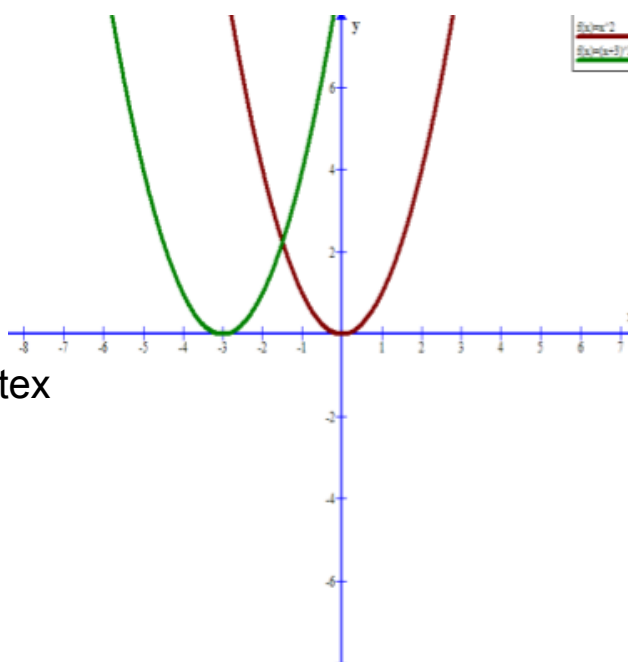
How do we get a vertex that is not (0,0)?

$$y=(x+3)^2$$

$$y=x^2+6x+9$$

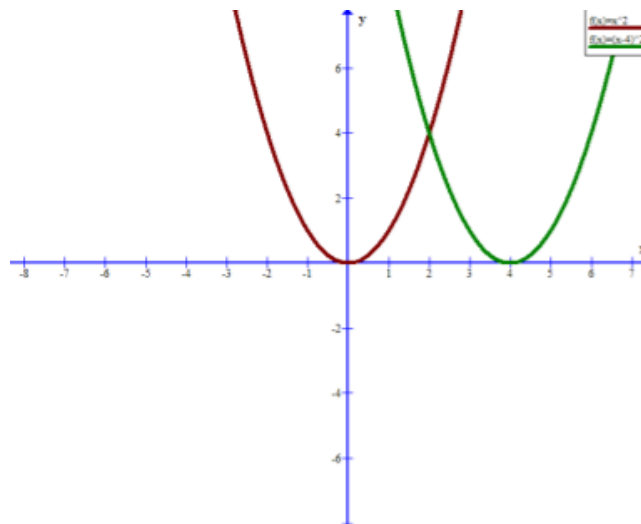
What changed?

-it moved over so our vertex
is now (-3,0)



What would have a vertex of (4,0)?

$$y=(x-4)^2$$

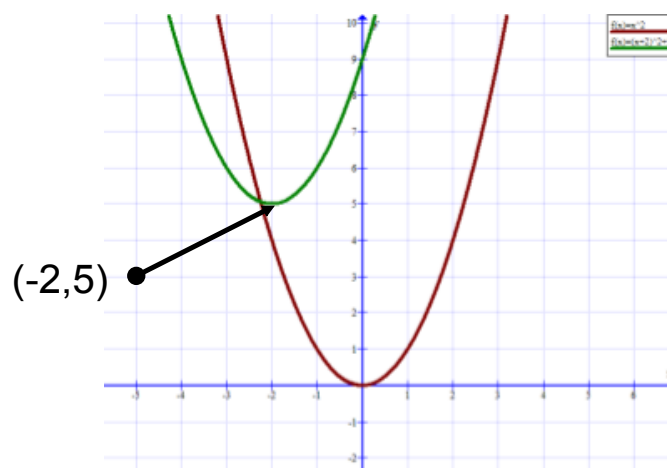


$$y-5=(x+2)^2$$

$$y=(x+2)^2+5$$

What do we know before we graph?

- open up or down? opens up, a is positive
- narrower, wider or the same as x^2 ? $a=1$, so the same width as x^2
- X-coordinate of the vertex? -2



General Parabolic Form:

$$y-k=a(x-h)^2$$

Vertex: (h,k)

Open up if $a>0$, open down if $a<0$

Narrow if $|a|>1$

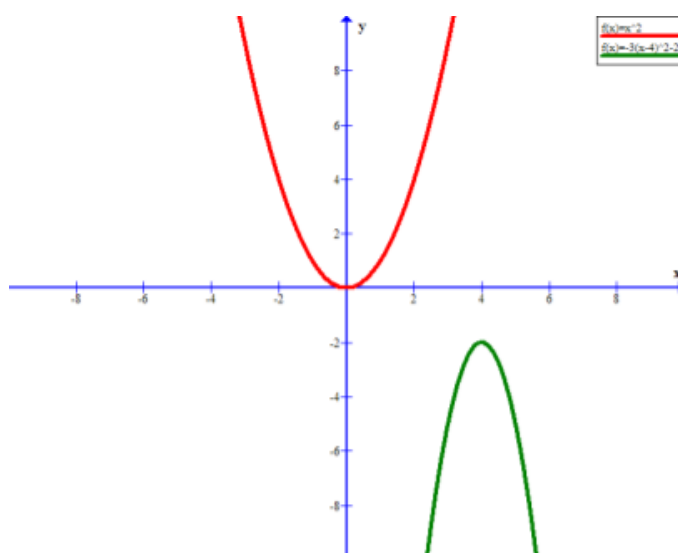
Wider if a is a fraction (positive or negative)

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

-opens down: $a < 0$

-narrower than x^2 : $|a| > 1$

-vertex: $(4, -2)$



The graph agrees with our predictions

$$y-3=(1/3)(x-5)^2$$

-opens up and is wider $a=1/3$

-Vertex: (5,3)

