

Unit 8 Day 1 Notes on Graphing Quadratic Functions (with Stretches, Shrinks & Reflections)

Key

The PARENT Function! $y = ax^2$ ($a=1$)

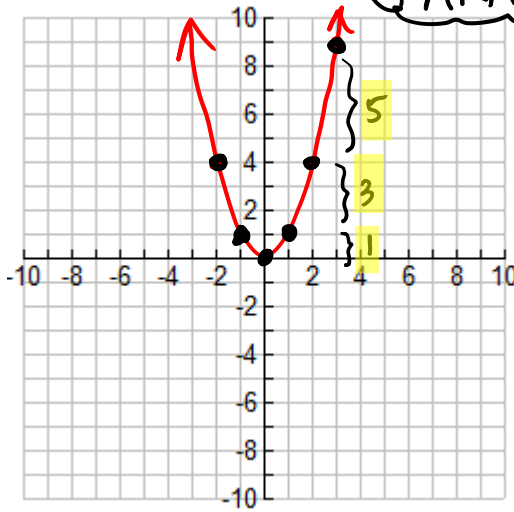
Work with your partner to complete the table for the function $y = x^2$. Think about how that table would translate to a graph. Describe the shape and any unique features.

PARABOLA

Observations

- opening upwards
- "U" shaped
- increases in a pattern of 1, 3, 5, 7...

x	y
-2	4
-1	1
0	0
1	1
2	4
3	9
4	16



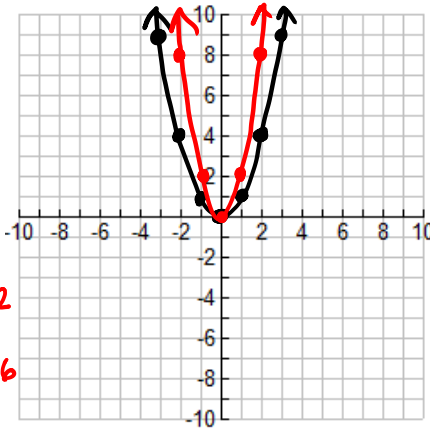
Make note of the PATTERN of the parent function ...

Let's Explore!

Graph the quadratic parent function $y = x^2$ on each graph below. Then, complete the table and sketch the graph of the function noted.

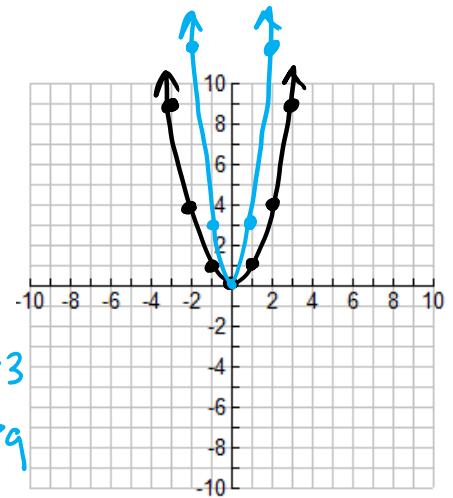
1. $y = 2x^2$

x	y
-2	8
-1	2
0	0
1	2
2	8



2. $y = 3x^2$

x	y
-2	12
-1	3
0	0
1	3
2	12



Observations? What did you notice about the new pattern?

1
3
5
7
→ $\times 2$
2
6
10
14

1
3
5
7
→ $\times 3$
3
9
15
21

Can you make a prediction with your partner about what the graph of $y = \frac{1}{4}x^2$ might look like?

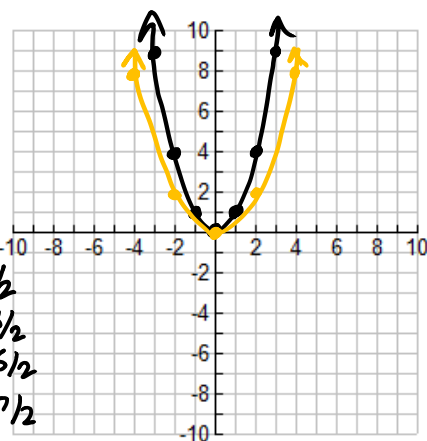
original pattern
is 1, 3, 5, 7 ...

multiply by $\frac{1}{4}$

$\frac{1}{4}, \frac{3}{4}, \frac{5}{4}, \frac{7}{4} \dots$

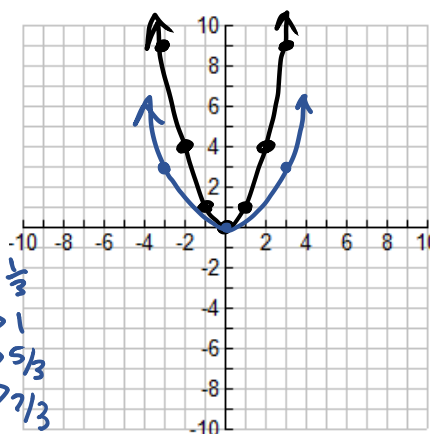
3. $y = \frac{1}{2}x^2$ vertical shrink by $\frac{1}{2}$

x	y
-4	8
-3	$\frac{9}{2}$
-2	2
-1	$\frac{1}{2}$
0	0
1	$\frac{1}{2}$
2	2
3	$\frac{9}{2}$
4	8



4. $y = \frac{1}{3}x^2$

x	y
-4	$\frac{16}{3}$
-3	3
-2	$\frac{4}{3}$
-1	$\frac{1}{3}$
0	0
1	$\frac{1}{3}$
2	$\frac{4}{3}$
3	3
4	$\frac{16}{3}$



Observations? What did you notice about the new pattern?

$1, 3, 5, 7 \xrightarrow{\times \frac{1}{2}} \frac{1}{2}, \frac{3}{2}, \frac{5}{2}, \frac{7}{2}, \dots$

$1, 3, 5, 7 \xrightarrow{\times \frac{1}{3}} \frac{1}{3}, 1, \frac{5}{3}, \frac{7}{3}, \dots$

Big Idea - Stretches & Shrinks!

$y = \underline{a}x^2$

$a > 1$, vertical stretch

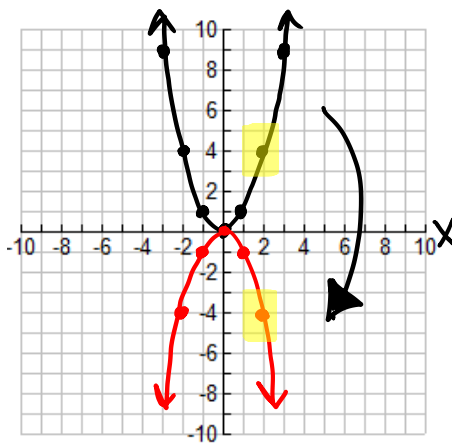
$0 < a < 1$, vertical shrink
"fraction"

What about NEGATIVES??

Graph the quadratic parent function $y = x^2$ on each graph below. Then, complete the table and sketch the graph of the function noted.

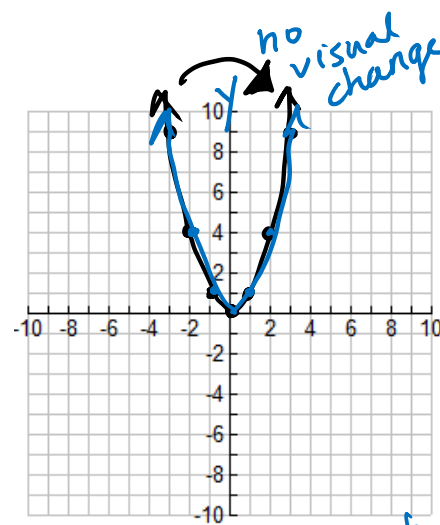
5. $y = -x^2$

x	y
-2	-4
-1	-1
0	0
1	-1
2	-4



6. $y = (-x)^2$

x	y
-2	4
-1	1
0	0
1	1
2	4



Big Idea - Reflections!

negative out front
* reflection over
x-axis (take opp. of
the y coordinate)

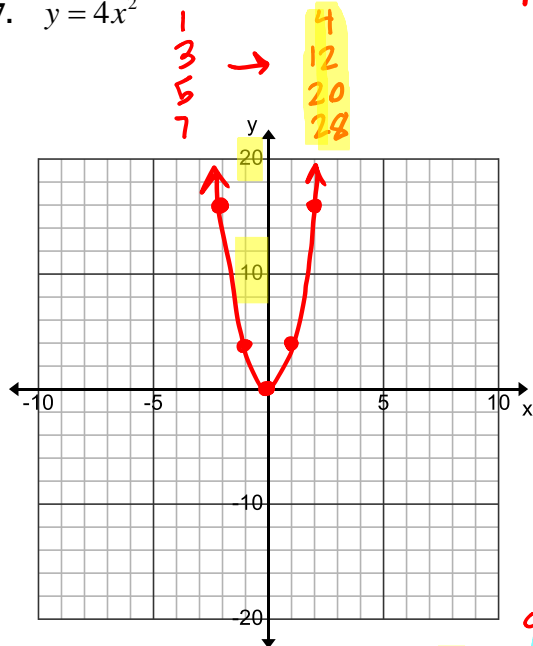
negative inside
* reflection over
y-axis (take opp. of
the x coordinate)

A bit of practice ...

Identify the transformations taking place on the parent function $y = x^2$. Then graph the transformed function. Use the pattern to help you graph. *Be mindful of the scale of each graph.*

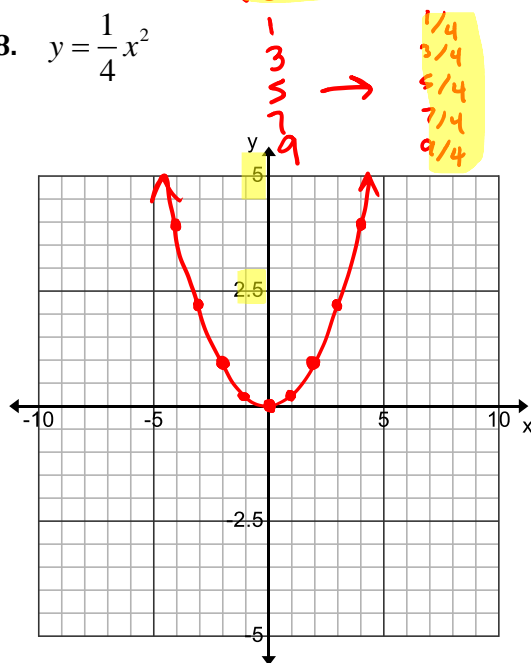
7. $y = 4x^2$

vertical stretch by 4



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

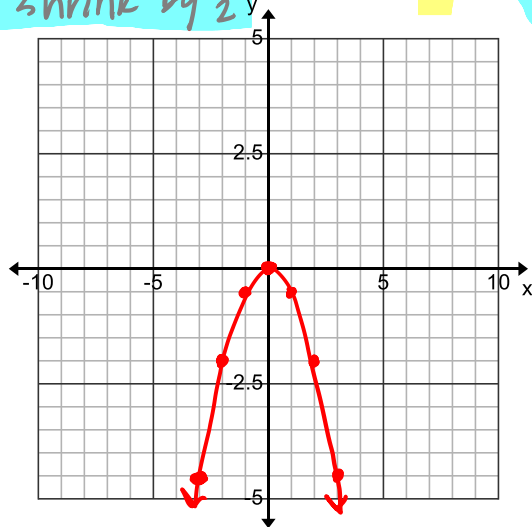
vertical shrink by $\frac{1}{4}$



9. $y = -0.5x^2$

reflect over x

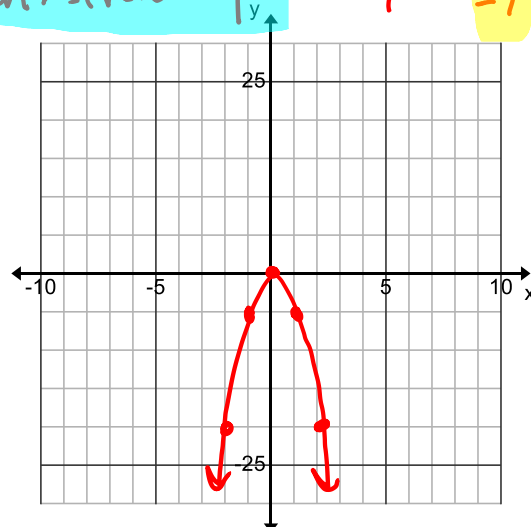
vert. shrink by $\frac{1}{2}$



10. $y = -5x^2$

reflect over x

vert. stretch by 5



Flip it around!

Write an equation of a quadratic function that has been transformed accordingly:

11. Vertically shrunk by a factor of 3

$$y = \frac{1}{3}x^2$$

12. Reflected over the x-axis and vertically stretched by a factor of 10

$$y = -10x^2$$

Up for a challenge?

13. Reflected over the y-axis and shifted up 7

$$y = (-x)^2 + 7$$