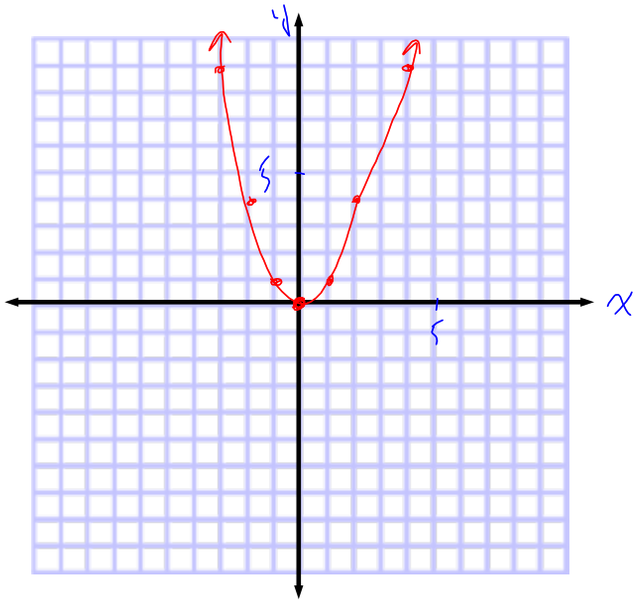
Warm Up

1. Sketch the base graph of all parabolas: $y = x^2$. Remember the pattern?



Pattern: Pattern *from the vertex*
over 1, up 1 → 1 ↑ 1
over 2, up 4 → 2 ↑ 4 (2^2)
over 3, up 9 → 3 ↑ 9 (3^2)
...etc.

2. Recall $y = x^2 + k$.
- Vertical translation by k units.

Ex. $y = x^2 + 3$

x	$y = x^2 + 3$
0	3

$\therefore$ (0 , 0) ⇒ (0, 3)

3. Recall $y = (x - h)^2$.
- Horizontal translation by h units.

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

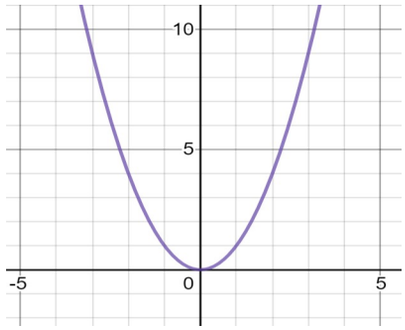
$(x - 4)^2$	y
4	0

$\therefore$ (0 , 0) ⇒ (4, 0)

Apr 1-12:02 PM

3.3B Investigate Transformations - Day 2

Recall: The base graph of all parabolas is $y = x^2$.

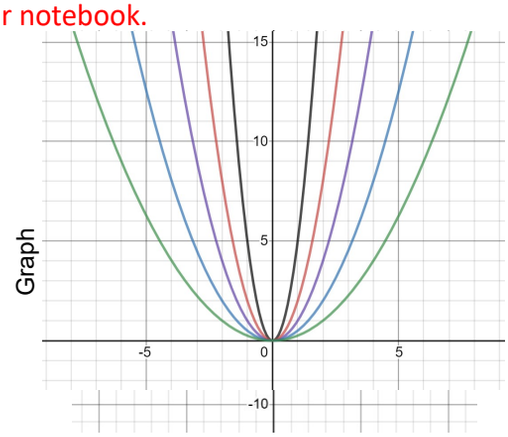


Pattern:
from the vertex
over 1, up 1
over 2, up 4
over 3, up 9
...

C. Investigate $y = ax^2$, $a > 0$

Using Desmos, compare the following graphs to $y = x^2$.
Sketch the graphs in your notebook.

1. $y = x^2$
2. $y = 5x^2$
3. $y = 2x^2$
4. $y = \frac{1}{2}x^2$
5. $y = \frac{1}{4}x^2$



What do you notice about the how the "a" value affects the graph?

Pattern:
from the vertex
over 1, up 1 $\times a$
over 2, up 4 $\times a$
over 3, up 9 $\times a$
...

Compared to $y = x^2$, the graph of $y = ax^2$:
if $a > 1$, there is a vertical stretch of a factor of "a"
if $0 < a < 1$,

stretching by a
compressing by $\frac{1}{a}$

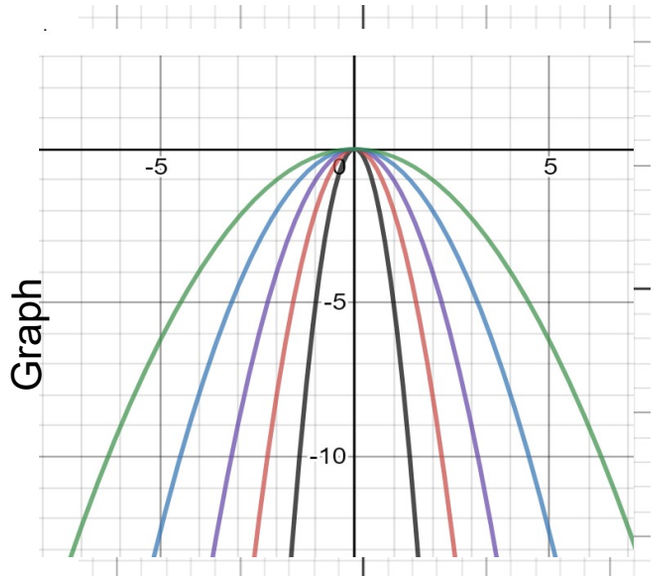
ex: $y = \frac{1}{3}x^2$ - Vertical stretch by $\frac{1}{3}$
OR
- Vertical Compression by 3

Mar 16-10:15 PM

D. Investigate $y = ax^2$, $a < 0$

Using Desmos, compare the following graphs to $y = x^2$.
Sketch the graphs in your notebook.

1. $y = -x^2$
2. $y = -5x^2$
3. $y = -2x^2$
4. $y = -\frac{1}{2}x^2$
5. $y = -\frac{1}{4}x^2$



What do you notice about the how the sign of "a" affects the graph?

Pattern:
from the vertex
over 1, up 1 $\times a$
over 2, up 4 $\times a$
over 3, up 9 $\times a$
...

Compared to $y = x^2$, the graph of $y = ax^2$:
if $a < 0$, there is a reflection over the x-axis

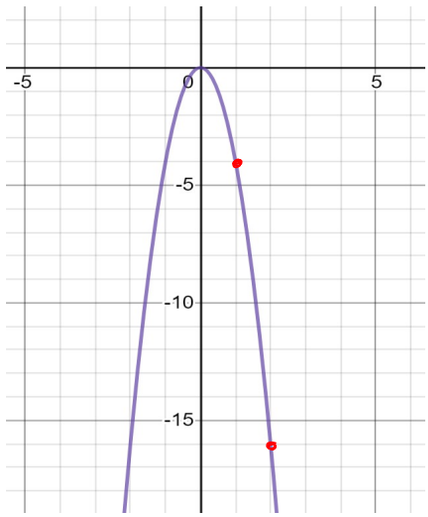
Mar 17-9:41 PM

Ex. 1 List the transformations on $y = x^2$ and sketch the graph.

a) $y = -4x^2$

- Vertical Reflection
- Vertical Stretch by 4

→1 ↑1 ↷ 1(-4) ↘ ↓4



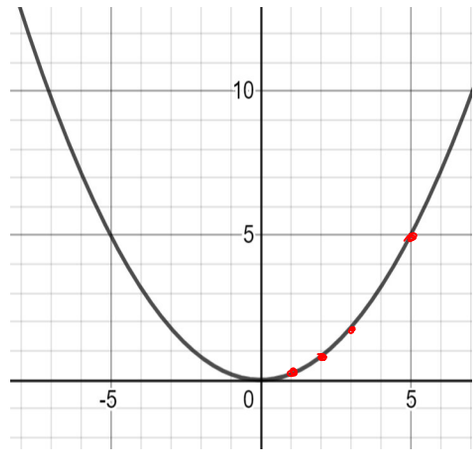
X	Y
-3	9
-2	4
-1	1
0	0
1	1
2	4
3	9
4	16
5	25

→2 ↑4 ↷ 4(-4) = -16

b) $y = 0.2x^2$ $0.2 = \frac{2}{10} = \frac{1}{5}$

$y = \frac{1}{5}x^2$

- Vertical stretch by $\frac{1}{5}$
OR
- Vertical compression by 5



Mar 16-10:25 PM

Ex. 2 Write an equation of a quadratic relation under the following transformations on $y = x^2$:

a) vertically stretched by a factor of 7

$y = 7x^2$

b) vertically compressed by a factor of 2 and reflected in the x-axis

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

c) vertically stretched by a factor of 4 and translated 5 units left

$y = 4(x+5)^2$ $4x^2$ $(x+5)^2$

d) vertically compressed by a factor of 3 and translated up 1 unit

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

e) reflected in the x-axis, vertically stretched by a factor of 3, translated 4 units left, translated 5 units down

$y = -3(x+4)^2 - 5$

reflected? $y = -x^2$

stretch $y = 3x^2$

left $y = (x+4)^2$

down $y = x^2 - 5$

Mar 16-10:25 PM

Homework

Pages 178-179
#C2, 4, 8, 13, 14

Text solutions are incorrect for 4be & 8b.



Mar 16-10:21 PM