

L4 Properties again and Stretches

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L4 Properties again and Stretches

Lesson 4 Properties of Quadratic Functions... again

Recall: General form of a quadratic function $y = ax^2 + bx + c$

If we complete the square, the equation takes the standard/transformational form

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

Recall:

- $V(h, k)$
- **Axis of Symmetry:** $x = h$ ** equation* ← x-coordinate of the vertex
- **Domain:** $(-\infty, \infty)$
- **Range:** $[k, \infty)$ or $(-\infty, k]$ ← min ← max
- **y-intercept** $(0, c)$

Example 1

Determine vertex, the equation of the axis of symmetry, the maximum/minimum value, and the domain and range of the following quadratic functions.

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

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

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

$$V(3, -4)$$

$$\text{a.o.s. } x = 3$$

$a > 0$
opens up
min @ -4

$$D(-\infty, \infty)$$

$$R[-4, \infty)$$

b) $y = -\frac{1}{2}(x + 3)^2 + 2$

$$V(-3, 2)$$

$$\text{a.o.s. } x = -3$$

$a < 0$
opens down
max @ 2

$$D(-\infty, \infty)$$

$$R(-\infty, 2]$$

Stretches/Compressions and Reflections

$y = ax^2$ Vertical stretch or compression by a factor of a

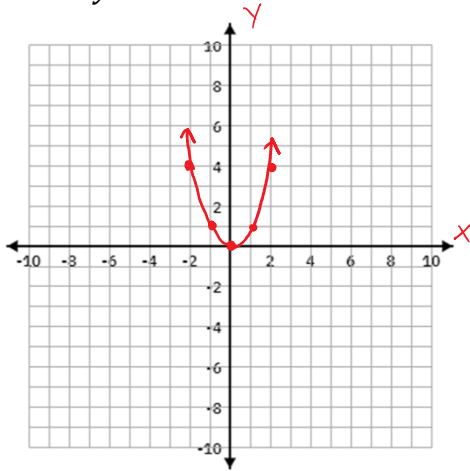
Multiply y -coordinates by a

- If $a > 1$ the graph will be stretched vertically
- If $0 < a < 1$, the graph will be compressed vertically

Example 1

Basic parabola

Sketch $y = x^2$.



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

$y = x^2$

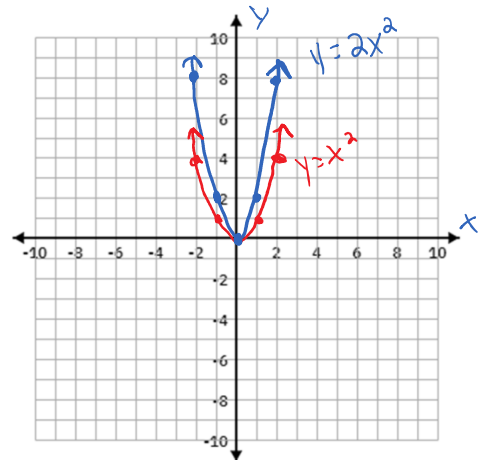
Example 2

Sketch the following graphs.

a.) $y = 2x^2$

↑
mult y -coordinates
by 2

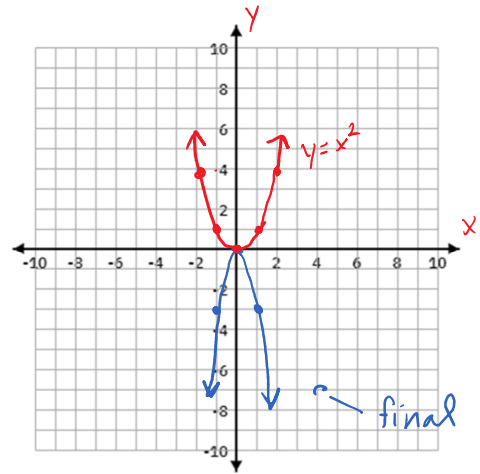
vertical stretch by a factor of 2



b.) $y = -3x^2$

↑
mult y-coordinates
by -3

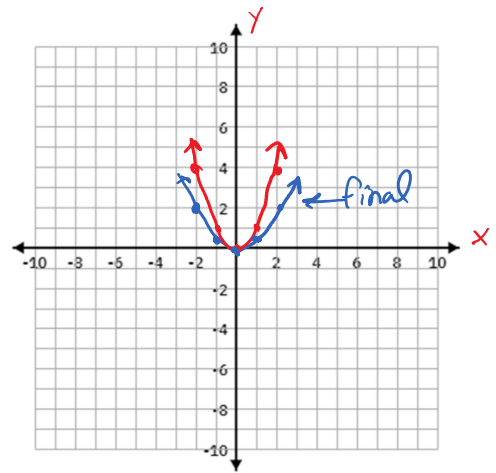
reflection over the x-axis
stretch by a factor of 3



c.) $y = \frac{1}{2}x^2$

↑
multiply y-coordinates
by $\frac{1}{2}$
(or divide by 2)

vertical compression by $\frac{1}{2}$



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