

Anatomy of a Transformation, applied to $f(x) = x^2$

Negative sign in front reflects around x-axis. The curve is upside-down.

y-multiplier, causes a vertical stretch (if >1) or shrink (if <1)

x-divisor, causes a horizontal shrink (if >1) or stretch (if <1)

y shift. Positive value shifts up; negative shifts down.

Negative inside the parent reflects around y-axis. The curve is a mirror image.

x shift. Negative values shift to the right; positive to the left. (Go figure.)

$$f(x) = -2(-3(x - 4))^2 + 6$$

Notes

- ▶ You should apply these transformations left-to-right:
 - ▶ Flip around x-axis (if any), vertical shrink/stretch, flip around y-axis (if any), horizontal shrink/stretch, shift x, shift y.
- ▶ Note that the transformations that apply to x are generally the reverse of what intuition would tell you:
 - ▶ The number inside the parent function is an *x divisor*, instead of multiplier; the "3" in the above example will make the graph $\frac{1}{3}$ as wide as normal.
 - ▶ The x offset is to the left when positive, to the right when negative.