

## 2.5 Graphing Techniques: Transformations

### Transformations and Graph Sketches

Suppose  $y = f(x)$  is the original function (one we looked at in a previous section)

$y = f(x) + k$  moves  $f(x)$   $k$  units up

$y = f(x) - k$  moves  $f(x)$   $k$  units down

$y = f(x - h)$  moves  $f(x)$   $h$  units to the right

$y = f(x + h)$  moves  $f(x)$   $h$  units to the left

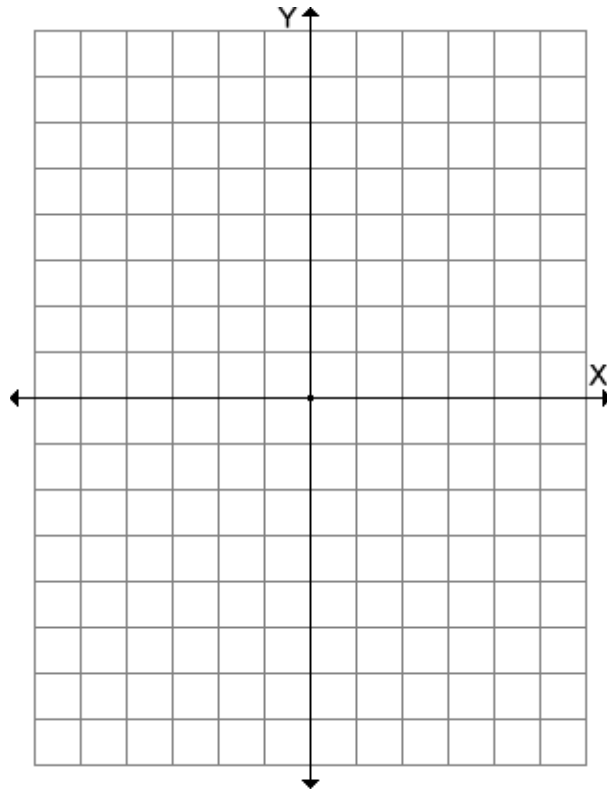
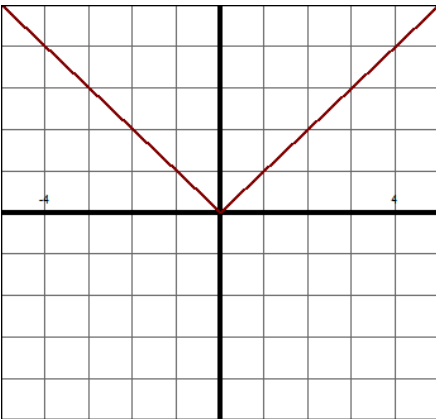
$y = -f(x)$  flips the graph over the horizontal axis

$y = f(-x)$  flips the graph over the vertical axis

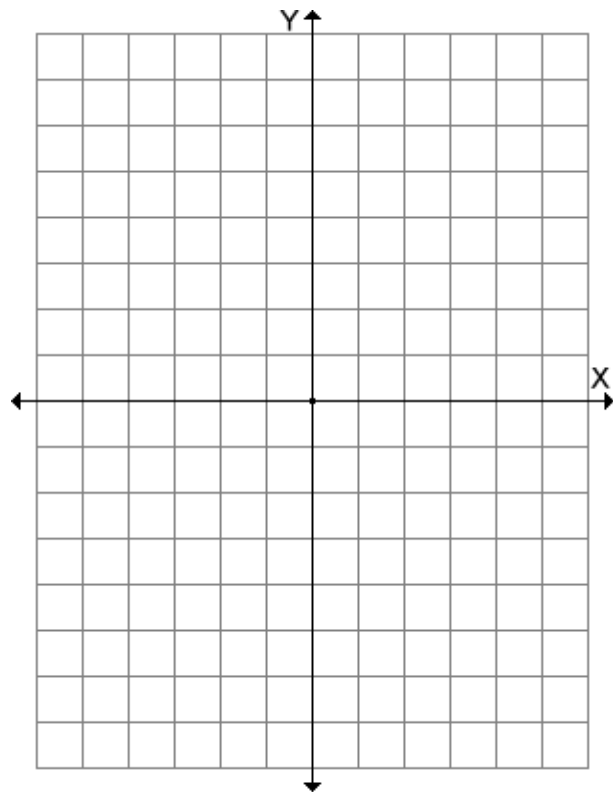
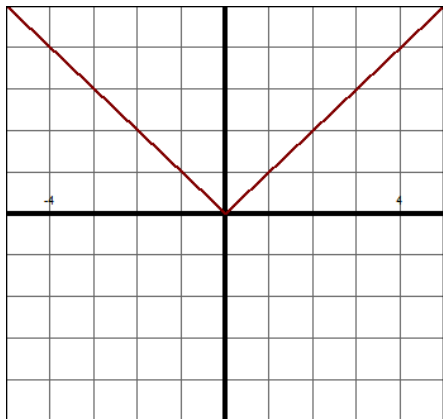
$y = a \cdot f(x)$  If  $|a| > 1$  then there is a vertical stretch. If  $0 < |a| < 1$ , then there is a vertical compression.

Let's look at some examples. For all of these we are just making a sketch of the function.

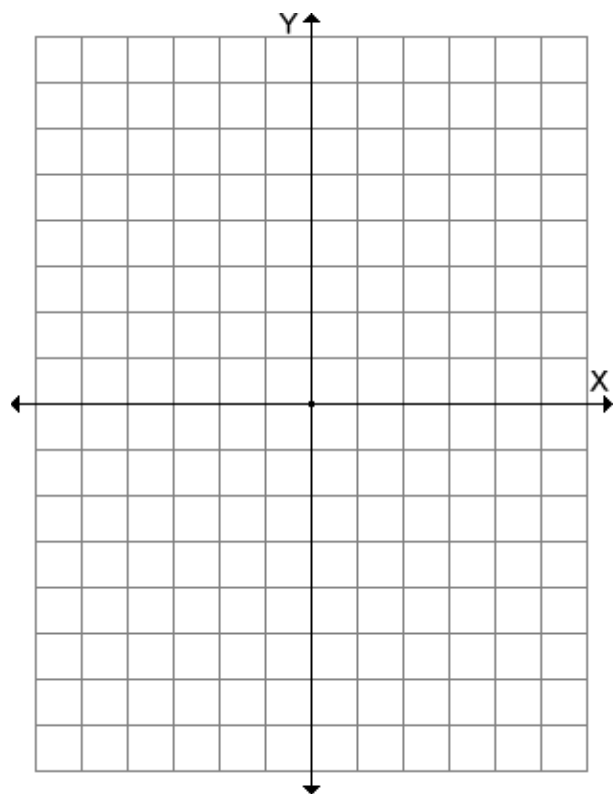
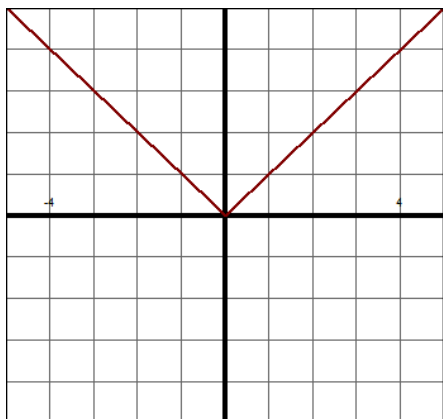
EXAMPLE: Sketch  $y = |x + 1|$  by using transformations.



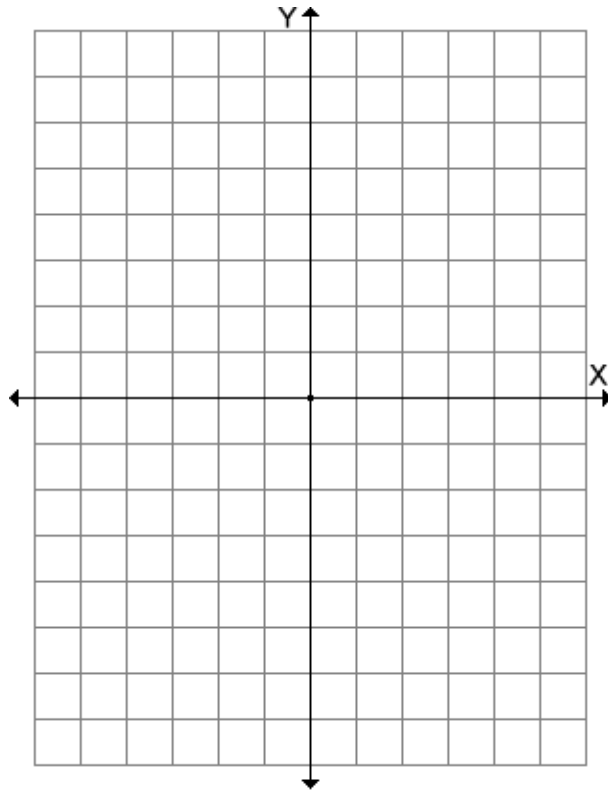
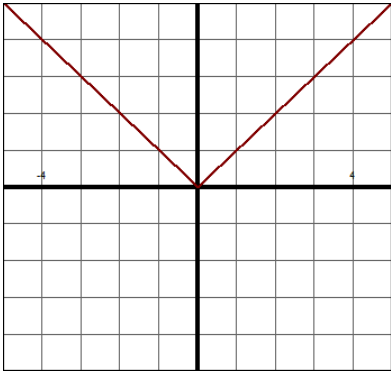
EXAMPLE: Sketch  $y = |x| + 2$  by using transformations.



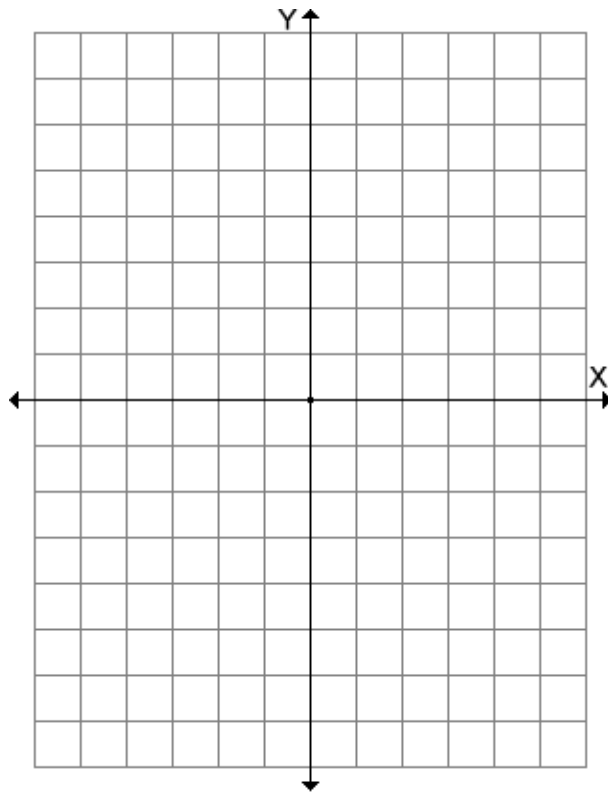
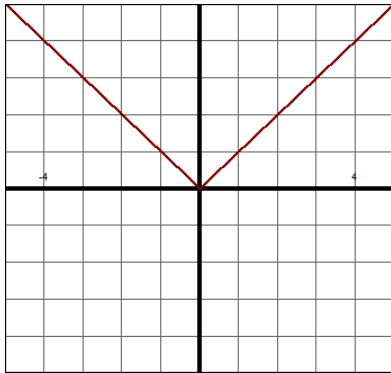
EXAMPLE: Sketch  $y = -|x|$  by using transformations.



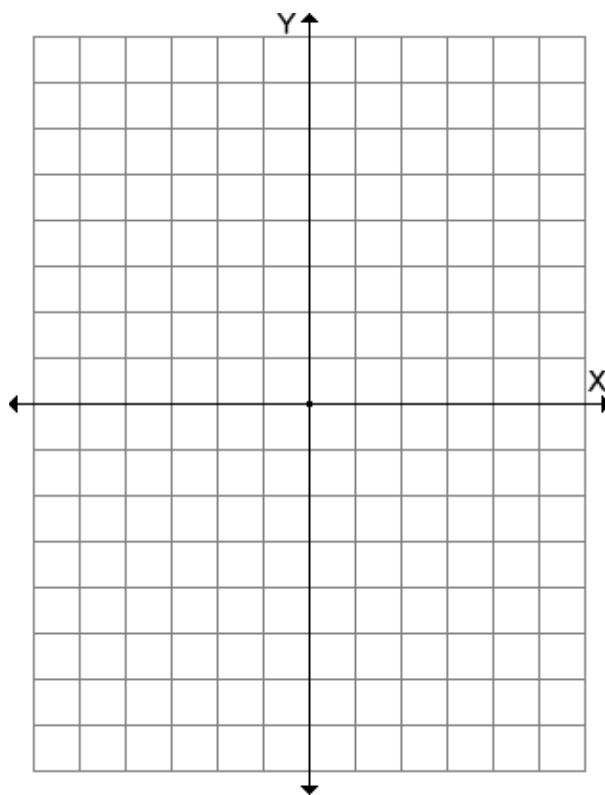
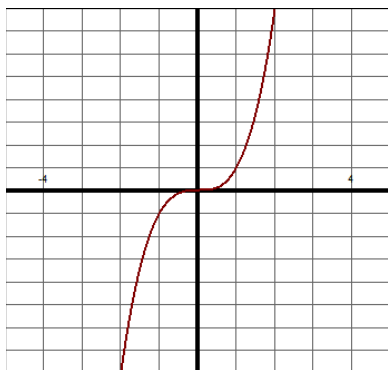
EXAMPLE: Sketch  $y = -|x+1| + 2$  by using transformations.



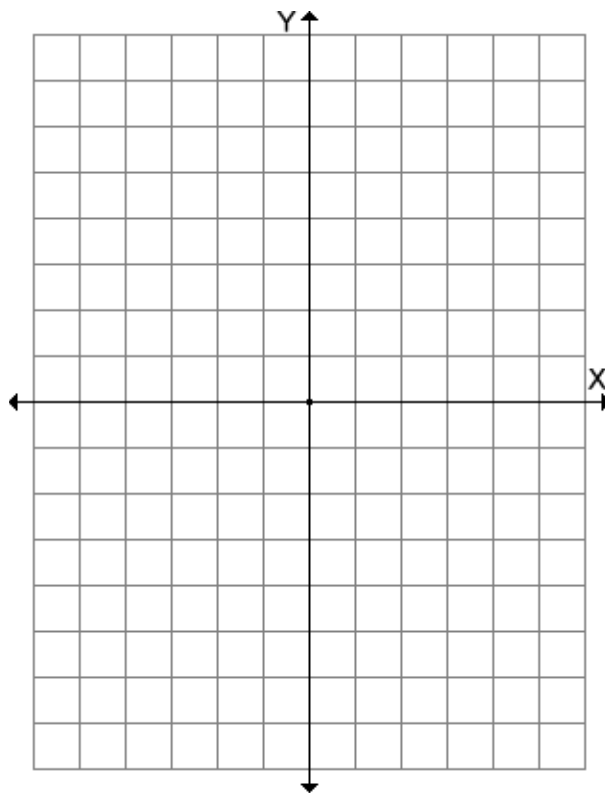
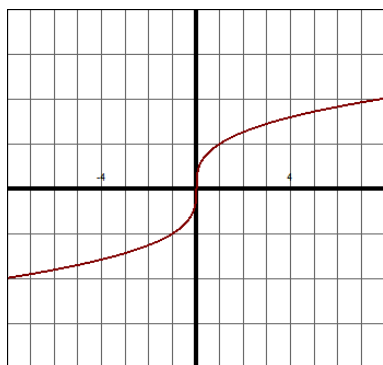
EXAMPLE: Sketch  $y = |2x|$  by using transformations.



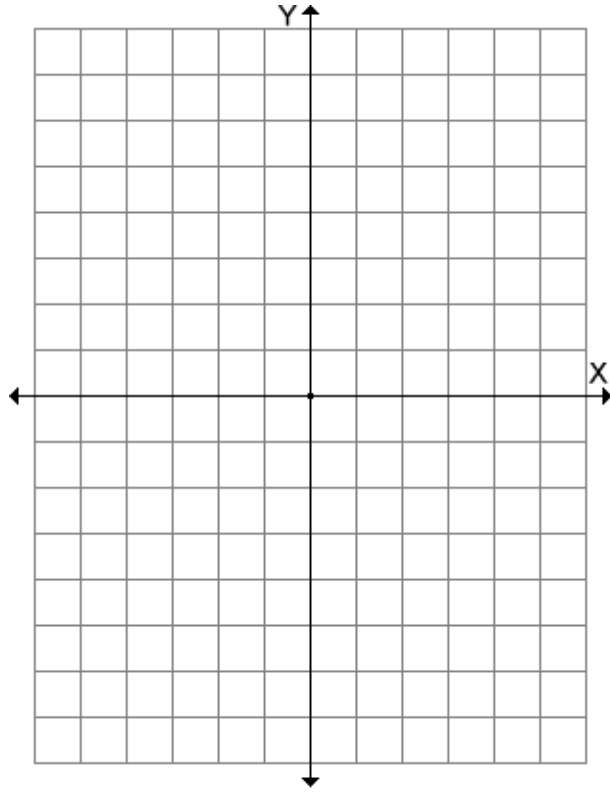
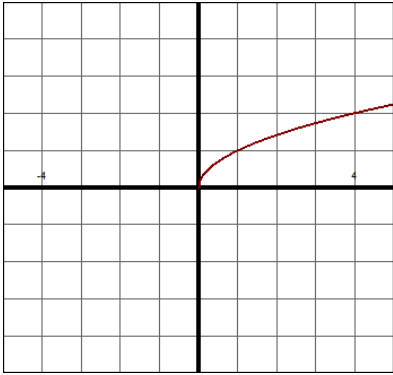
EXAMPLE: Sketch  $y = \frac{1}{2}x^3$  by using transformations.



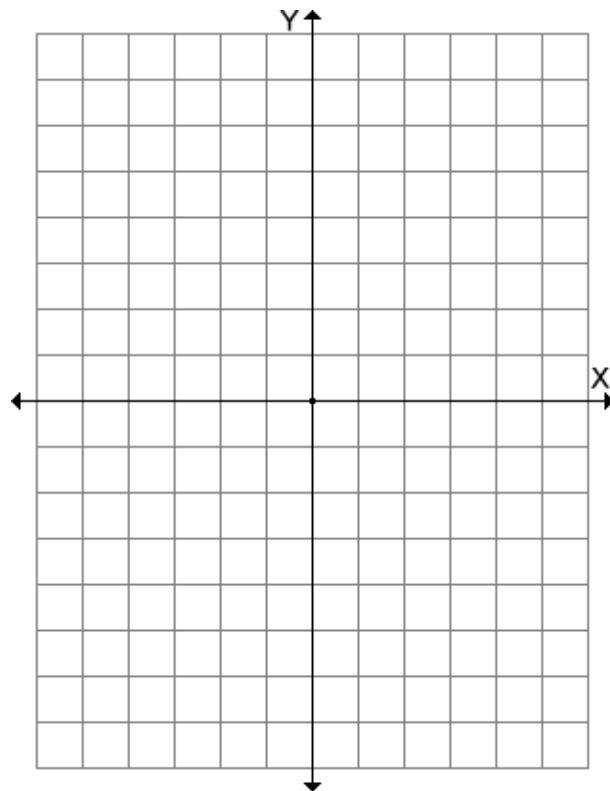
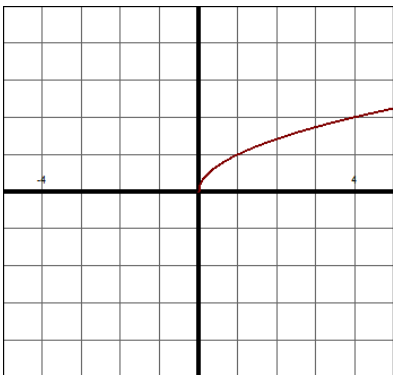
EXAMPLE: Sketch  $y = 3 \cdot \sqrt[3]{x}$  by using transformations.



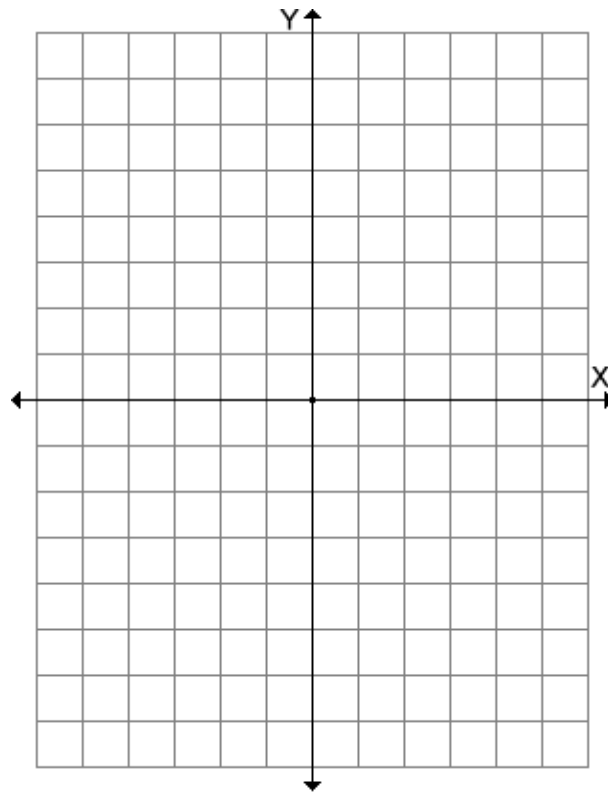
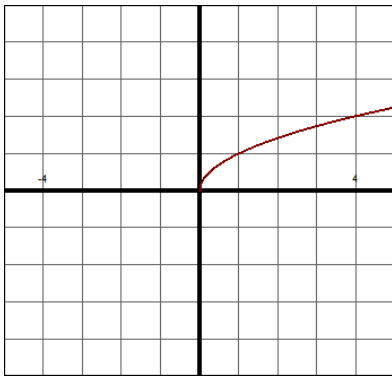
EXAMPLE: Sketch  $y = \sqrt{x-2} - 1$  by using transformations.



EXAMPLE: Sketch  $y = -\sqrt{x+1} - 2$  by using transformations.



EXAMPLE: Sketch  $y = \sqrt{4-x} + 2$  by using transformations.



EXAMPLE: Sketch  $y = -\frac{1}{2}(x-2)^2 - 1$  by using transformations.

