Algebra 2

Chapter 2 Handout 2.6

Families of Functions

Characteristics of an Absolute Value Function

1) The equation is $f(x) = a|x - h| + k$

2) The vertex is (h, k)

3) The axis of symmetry is x = h

4) The graph is a v-shaped (2 linear pieces with opposite slopes)

5) "a" term states: a) a > 0 opens up; a < 0 opens down

           b) |a| > 0 graph is wider than parent function (stretch)

           0 < |a| < 0 graph is narrower than parent functions (shrink)

6) "h" term states: h > 0 graph moves to the right

           h < 0 graph moves to the left

7) "k" terms states: k > 0 graph moves up

           k < 0 graph moves down

Write an equation to translate the graph of $y = |x|$.

4. down $\frac{1}{2}$ units

5. up 3.5 units and moves right 2

$a = 1$
$h = 0$
$k = -\frac{1}{2}$

$f(x) = a|x-h| + k$

$f(x) = 1|x-0| + -\frac{1}{2}$

$\boxed{f(x) = |x| - \frac{1}{2}}$

$a = 1$
$h = 2$
$k = 3.5$

$f(x) = a|x-h| + k$

$f(x) = 1|x-2| + 3.5$

$\boxed{f(x) = |x-2| + 3.5}$

6. Stretch 2 and moves up 4

7. moves down $\frac{1}{2}$, left 3, and and has a shrink of $\frac{1}{4}$

$a = 2$
$h = 0$
$k = 4$

$f(x) = a|x-h| + k$

$f(x) = 2|x-0| + 4$

$\boxed{f(x) = 2|x| + 4}$

$a = \frac{1}{4}$
$h = -3$
$k = -\frac{1}{2}$

$f(x) = a|x-h| + k$

$f(x) = \frac{1}{4}|x - (-3)| + -\frac{1}{2}$

$\boxed{f(x) = \frac{1}{4}|x+3| - \frac{1}{2}}$

Extra: moves right 3, stretch $\frac{4}{3}$, and reflects across the x-axis.

$a = -\frac{4}{3}$
$h = 3$
$k = 0$

$f(x) = a|x-h| + k$

$f(x) = -\frac{4}{3}|x-3| + 0$

$\boxed{f(x) = -\frac{4}{3}|x-3|}$

8. The graph is a translation of $y = |x|$. Write an equation for the graph.
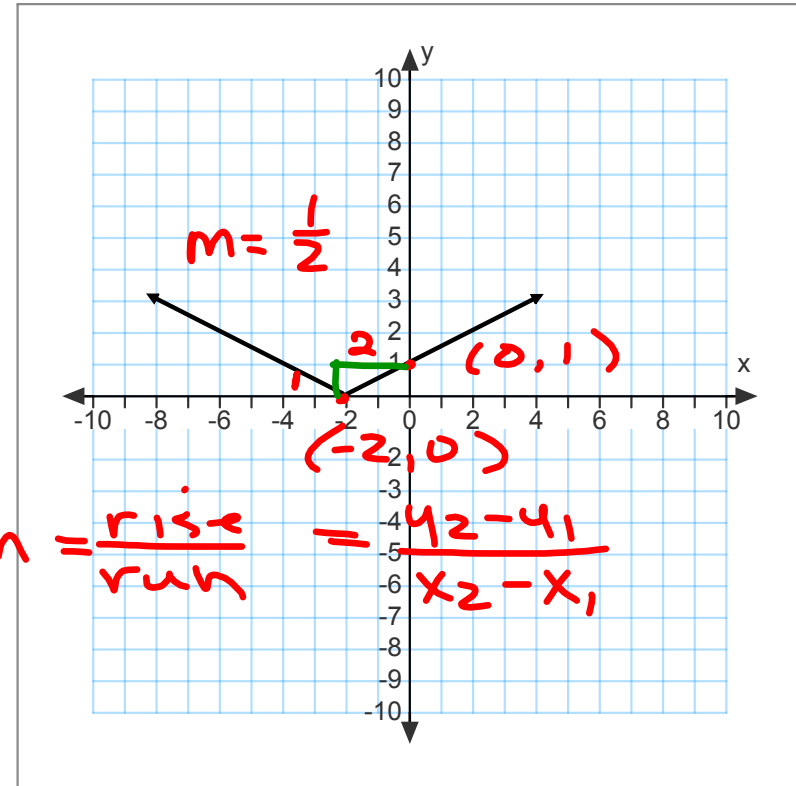
$$f(x) = a|x-h| + k$$

$$V: (-2, 0)$$

$$a = \frac{1}{2}$$

$$h = -2$$

$$k = 0$$

$$f(x) = \frac{1}{2}|x-(-2)| + 0$$

$$\boxed{f(x) = \frac{1}{2}|x+2|}$$

$$m = \frac{rise}{run} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{1}{2}$$

$(0, 1)$

$(-2, 0)$

9. A function is a vertical shrink of $y = |x|$ by a factor of $\dfrac{1}{3}$.
Write an equation for the reflection of the function across the x-axis.

$$f(x) = a|x-h| + k$$

$$a = -\tfrac{1}{3}$$

$$h = 0$$

$$f(x) = -\tfrac{1}{3}|x-0| + 0$$

$$k = 0$$

$$\boxed{f(x) = -\tfrac{1}{3}|x|}$$