Absolute Value Functions

<u>Absolute Value</u> - the distance from zero.

$$|-6| = \textcolor{red}{6} \qquad\qquad |6| = \textcolor{red}{6}$$

$$\textcolor{red}{\text{distance}=6 \quad \text{distance}=6}$$

−6   0   6
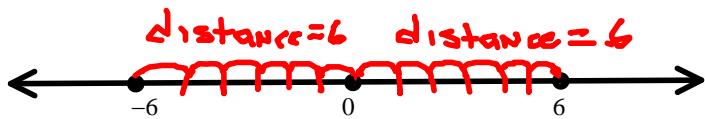
Directions: Evaluate each.

1. $|0-3| = \textcolor{red}{|-3| = \boxed{3}}$

2. $|-4 \cdot 4| = \textcolor{red}{|-8| = \boxed{8}}$

3. $|6+(\cdot 3)| = \textcolor{red}{|9| = \boxed{9}}$

4. $-(|-9|-|-7|) = \textcolor{red}{-(9-7) = -(2) = \boxed{-2}}$

5. $|10|-|-6|-|4| = \textcolor{red}{10-6-4 = \boxed{0}}$

6. $|(4-9)+|-3|| = \textcolor{red}{|(4-9)+3|}$
$$\textcolor{red}{= |-5+3| = |-2| = \boxed{2}}$$

<u>Absolute Value Function</u>

$f(x) = |x|$

$\textcolor{red}{(0,0)}$ $\textcolor{red}{\text{D: All real numbers}}$
$\textcolor{red}{\text{R: } y \geq 0}$
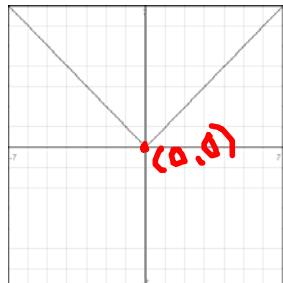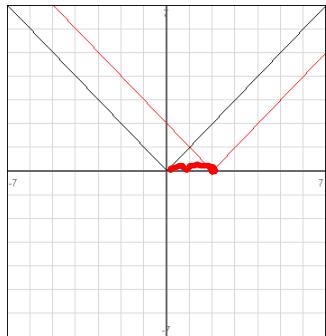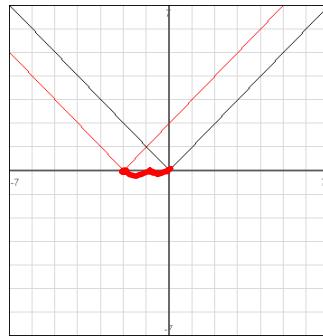
$f(x) = |x-2|$
$\textcolor{red}{\rightarrow}$

$f(x) = |x+2|$
$\textcolor{red}{\leftarrow}$

$f(x) = |x| + 2$

↑
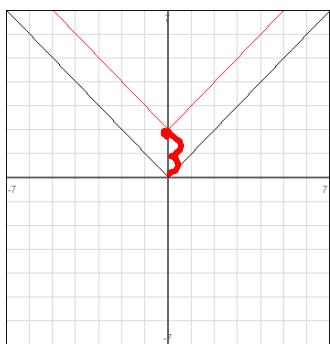
$f(x) = |x| - 2$

↓
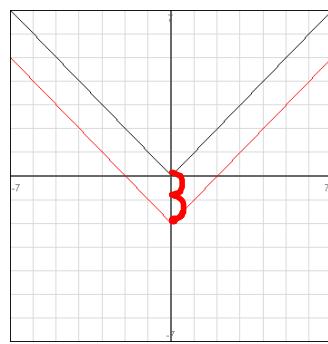

$f(x) = 2|x|$

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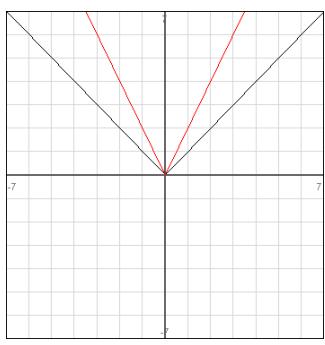
$f(x) = \frac{1}{2}|x|$

wider
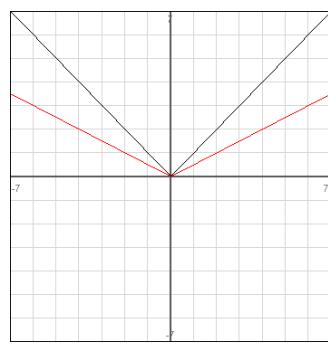
$f(x) = -|x|$

upside down
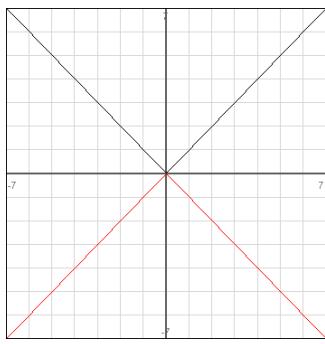
Directions: Sketch a graph of each function and find the domain and range.

7. $f(x) = |x-3| + 1$

$\rightarrow 3 \uparrow 1$

Right 3, up 1

V (3, 1)

$f(x) = |x|$
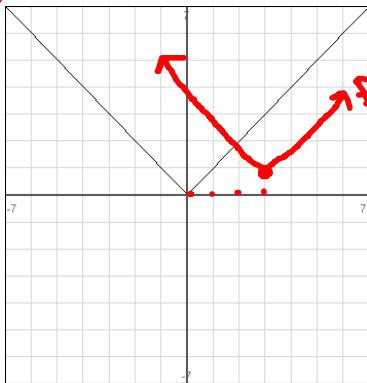
$f(x) = |x-3| + 1$

D: all real numbers

$\mathbb{R}$

R: $y \geq 1$

8. $f(x) = -|x+1|$

$\leftarrow$ left 1

reflect over the
x axis
left 1

V (-1, 0)
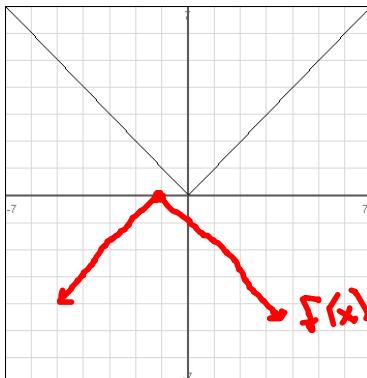
$f(x) = -|x+1|$

D: $\mathbb{R}$
R: $y \leq 0$

9. $f(x) = 4|x-1|$

$\vee \rightarrow 1$

skinnier
shift 1 unit right

V (1, 0)
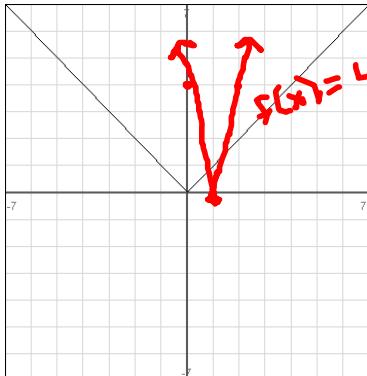
$f(x) = 4|x-1|$

D: $\mathbb{R}$
R: $y \geq 0$

10. $f(x) = -\dfrac{1}{2}|x-2|+3$

wider
reflected over x-axis
$\begin{cases} \text{right } 2 \\ \text{up } 3 \end{cases}$

$V(2,3)$

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

D: $\mathbb{R}$

R: $y \le 3$