Name:______________________________________ Date:________

PCH: Algebraic Definition of Absolute Value Ms. Loughran

Do Now:

1. Write an equation, in standard form, that is perpendicular to the line $5x-2y=2$ and that passes through the point (-2,-6).

$5x-2=2y$

$\frac{5}{2}x-1=y$

$m=\frac{5}{2}$

$m_{\perp}=-\frac{2}{5}$

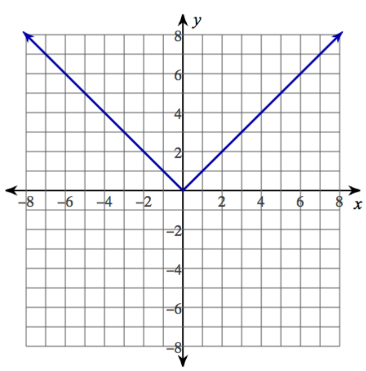
$5\left(y+6=-\frac{2}{5}(x+2)\right)$

$5y+30=-2(x+2)$

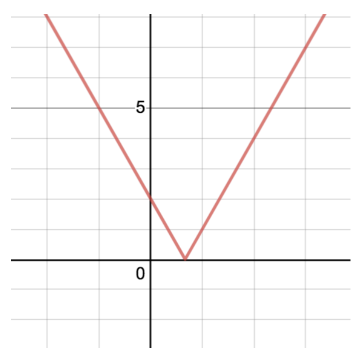
$5y+30=-2x-4$

$2x+5y=-34$

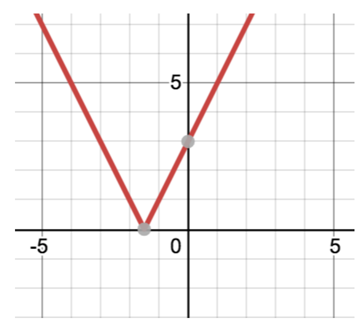
2. Write equations for each piecewise function whose graph is shown:



(a)



(b)



(c)

$f(x)=\begin{cases}-x & x<0\\ x & x\geq 0\end{cases}$

$g(x)=\begin{cases}-3x+2 & x\leq 2/3 \text{ *}\\ 3x-2 & x>2/3\end{cases}$

$h(x)=\begin{cases}-2x-3 & x<-3/2\\ 2x+3 & x\geq -3/2\end{cases}$

$-3x+2=0$

$2=3x$

$\frac{2}{3}=x$

$f(x)=|x|$

$g(x)=|3x-2|$

$h(x)=|2x+3|$

Algebraic definition of Absolute Value:

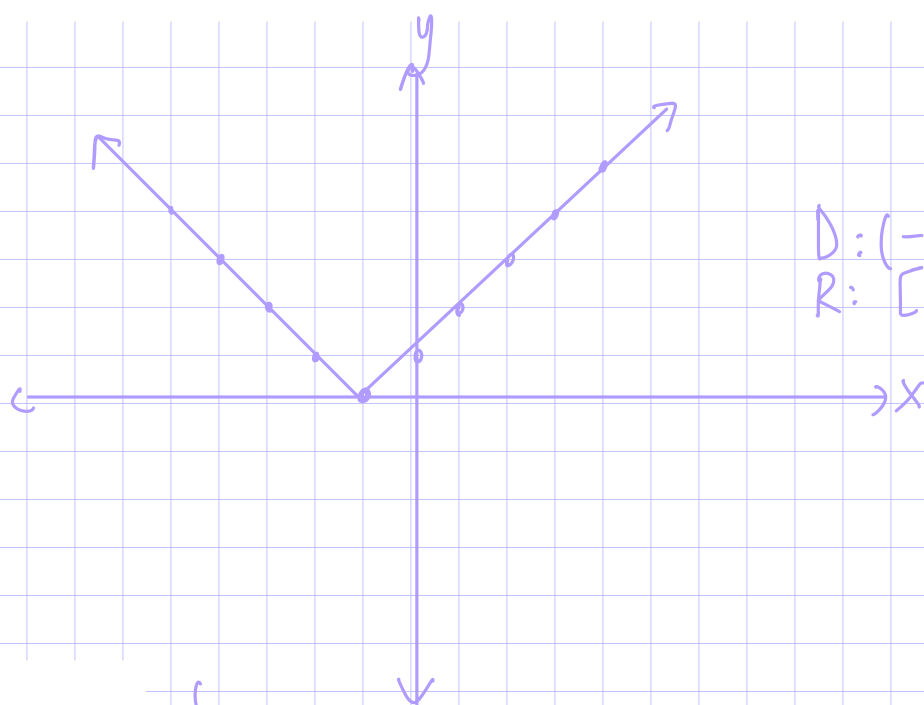
For any real number *x*,

$$|x| = \begin{cases} x & x \geq 0 \\ -x & x < 0 \end{cases}$$

Use the algebraic definition of absolute value to rewrite each expression and then sketch the graph on a separate piece of graph paper. Then find the domain and range of each graph.

1. $|x+1| = \begin{cases} x+1 & x+1 \geq 0,\ x \geq -1 \\ -(x+1) \text{ or } -x-1 & x < -1 \end{cases}$

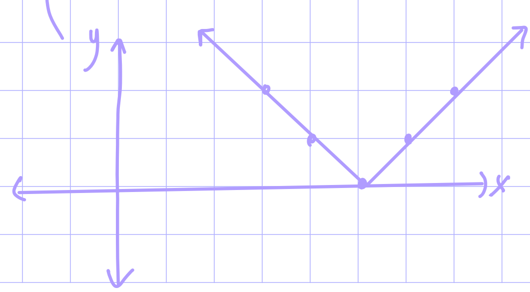
|x| left one



D: $(-\infty, \infty)$
R: $[0, \infty)$

3. $|5-x| = |x-5| = \begin{cases} x-5 & x-5 \geq 0,\ x \geq 5 \\ -(x-5) & x < 5 \end{cases}$

|x| right 5

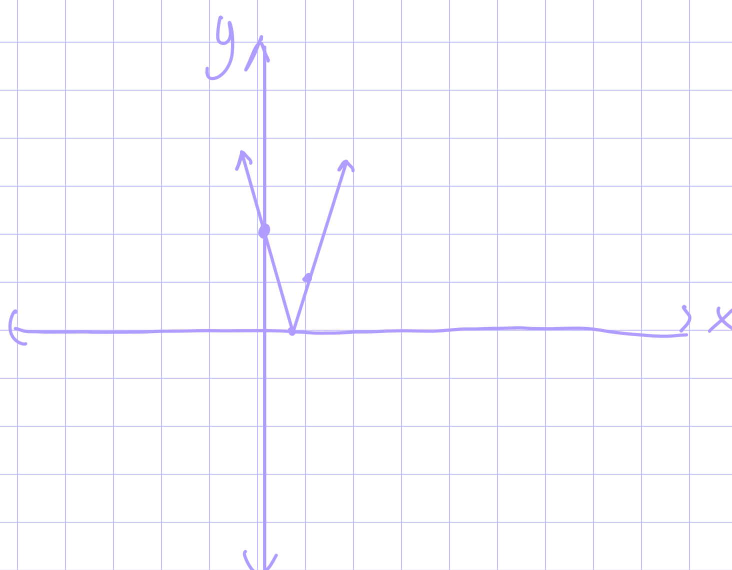


D: $(-\infty, \infty)$
R: $[0, \infty)$

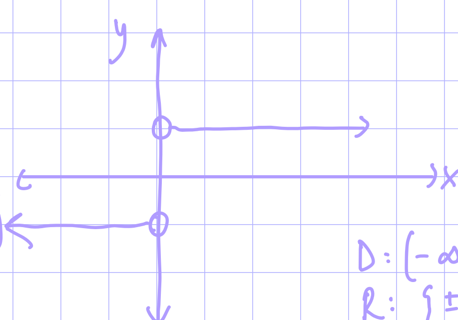
4. $|3x-2| = \begin{cases} 3x-2 & 3x-2 \geq 0, \quad x \geq 2/3 \\ -3x+2 & x < 2/3 \end{cases}$

$|3(x-2/3)|$

right 3
mult. y's 6



9. $\dfrac{|x|}{x} = \begin{cases} \dfrac{x}{x} = 1 & x > 0 \\ \dfrac{-x}{x} = -1 & x < 0 \end{cases}$

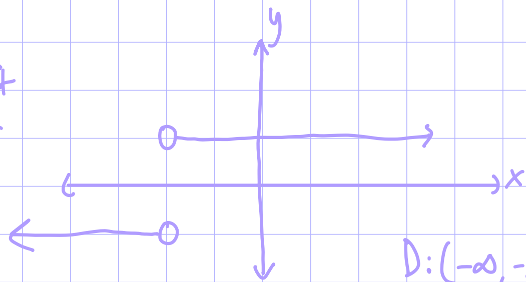


SB
D: $\{x \mid x \in \mathbb{R}/0\}$

D: $(-\infty, 0) \cup (0, \infty)$
R: $\{\pm 1\}$

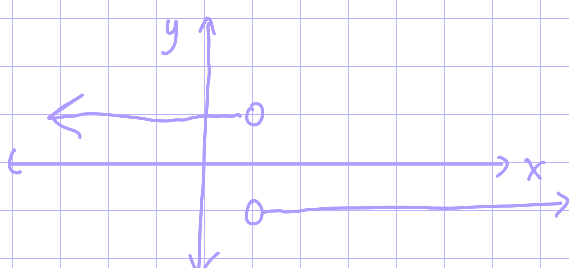
10. $\frac{|x+2|}{x+2} = \begin{cases} \frac{x+2}{x+2} = 1 & x+2>0,\ x>-2 \\ \frac{-(x+2)}{x+2} = -1 & x<-2 \end{cases}$

transformation of $\frac{|x|}{x}$ → moves it left 2 units



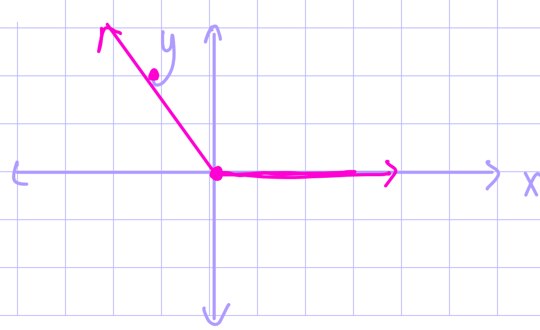
D: $(-\infty,-2) \cup (-2,\infty)$
R: $\{\pm 1\}$

11. $\frac{|x-1|}{1-x} = \begin{cases} \frac{x-1}{1-x} = -1 & x-1>0,\ x>1 \\ \frac{-(x-1)}{1-x} = 1 & x<1 \end{cases}$



D: $(-\infty,1) \cup (1,\infty)$
R: $\{\pm 1\}$

14. $|x|-x = \begin{cases} x - x = 0 & x \geq 0 \\ -x - x = -2x & x<0 \end{cases}$



D: $(-\infty,\infty)$
R: $[0,\infty)$

Homework 10-18

Name: Key Date:__________

: More Piecewise Functions

Evaluate:

1. $f(x)=\begin{cases}3-x, & x\le 1\\ 2x, & x>1\end{cases}$

$f(0)=$ 3

$f(1)=$ 2

$f(2.5)=$ 5

2. $f(x)=\begin{cases}1, & x<0\\ \sqrt{x}, & x\ge 0\end{cases}$

$f(-1)=$ 1

$f(0)=$ 0

$f(5)=$ $\sqrt{5}$

3. $f(x)=\begin{cases}\frac{1}{x}, & x<0\\ -3x, & x\ge 0\end{cases}$

$f(-1)=$ -1

$f(0)=$ 0

$f(\pi)=$ -3π

4. $f(x)=\begin{cases}4-x^2, & x<1\\ \frac{3}{2}x+\frac{3}{2}, & 1\le x\le 3\\ x+3, & x>3\end{cases}$

$f(.5)=$ $4-(.5)^2 = 4-.25 = 3.75$

$f(1)=$ $3/2+3/2 = 6/2 = 3$

$f(3)=$ $3/2(3)+3/2 = \frac{9}{2}+\frac{3}{2} = \frac{12}{2} = 6$

$f(4)=$ $4+3=7$

5. $f(x)=\begin{cases}1, & x<5\\ 0, & x\ge 5\end{cases}$

$f(0)=$ 1

$f(6)=$ 0

$f(5)=$ 0

6. $f(x)=\begin{cases}x^2, & x<0\\ x^3, & 0\le x\le 1\\ 2x-1, & x>1\end{cases}$

$f(-1)=$ 1

$f(1)=$ 1

$f(0)=$ 0

$f(2.5)=$ 4

Sketch each function below without using a graphing calculator. Find the domain and range of each function. Remember, all functions must pass the vertical line test.

7. $f(x)=\begin{cases}x-3, & x\le 1\\ 2x, & x>1\end{cases}$

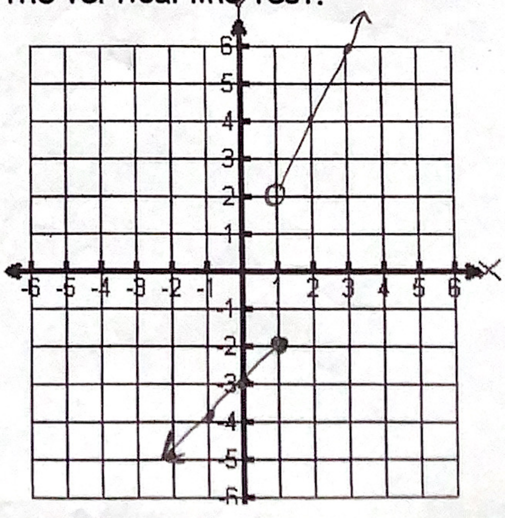
$D_f=$ $(-\infty,\infty)$

$R_f=$ $[-\infty,-2]\cup(2,\infty)$

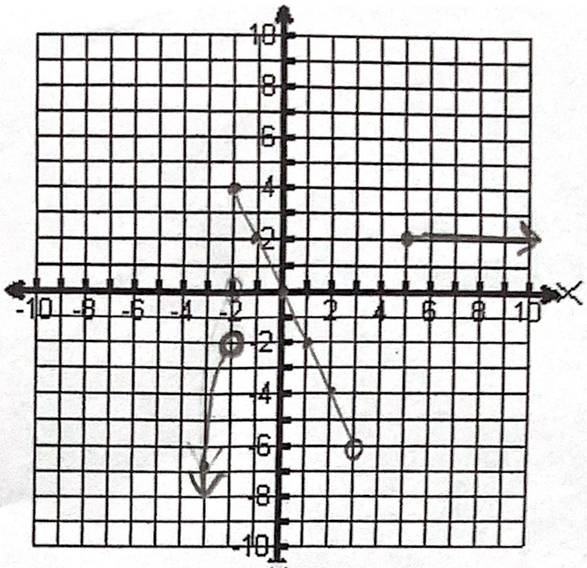
$f(0)=$ -3

$f(1)=$ -2

$f(2)=$ 4



8. $f(x)=\begin{cases} 2, & x \geq 5 \\ -2x, & -2 \leq x < 3 \\ 2-x^2, & x < -2 \end{cases}$



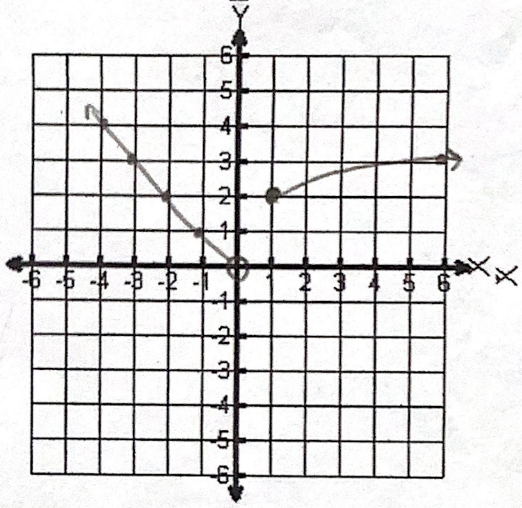
$D_f =$ $(-\infty,3) \cup [5,\infty)$

$R_f =$ $(-\infty, 4]$

Evaluate: $f(-2)=$ 4

$f(5)=$ 2

9. $f(x)=\begin{cases} \sqrt{x+3}, & x \geq 1 \\ -x, & x < 0 \end{cases}$



$D_f =$ $(-\infty,0) \cup [1,\infty)$

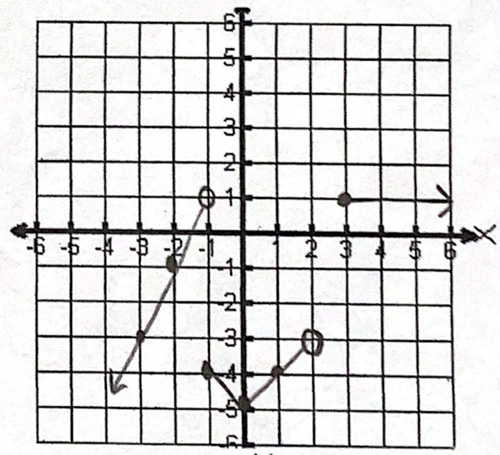
$R_f =$ $(0, \infty)$

Evaluate: $f(1)=$ 2

$f(6)=$ 3

$f(0)=$ not defined

10. $f(x)=\begin{cases} 2x+3, & x < -1 \\ |x|-5, & -1 \leq x < 2 \\ 1, & x \geq 3 \end{cases}$



$D_f =$ $(-\infty,2) \cup [3,\infty)$

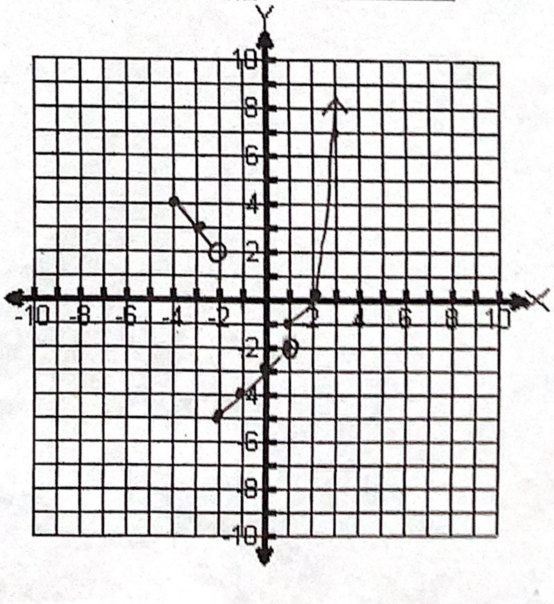
$R_f =$ $(-\infty, 1]$

Evaluate: $f(1)=$ -4

$f(6)=$ 1

$f(0)=$ -5

11. $f(x)=\begin{cases} -x, & -4 \leq x < -2 \\ x-3, & -2 \leq x < 1 \\ x^2-2, & x \geq 1 \end{cases}$



$D_f =$ $[-4, \infty)$

$R_f =$ $[-5,-2) \cup [-1, \infty)$

Evaluate: $f(-4)=$ 4

$f(-2)=$ -5

$f(1)=$ -1