

Part I. Carefully graph each of the following. Identify whether or not the graph is a function. Then, evaluate the graph at any specified domain value. You may use your calculators to help you graph, but you must sketch it carefully on the grid!

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

Function? Yes or No
 $1 - 2 + \frac{2}{3} = y \quad (-1, 2)$

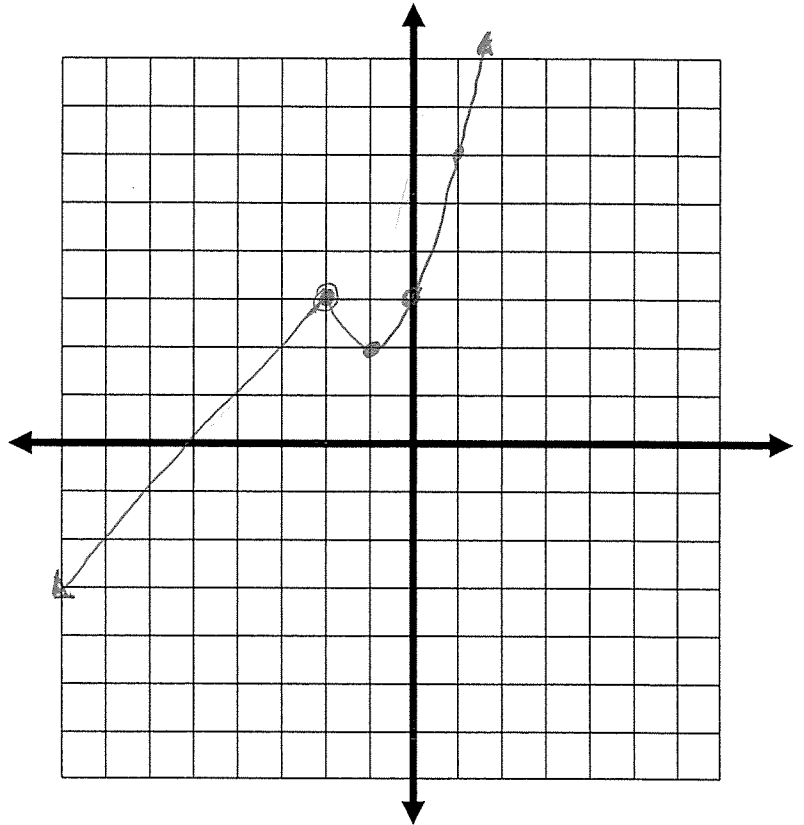
$f(3) = 9 + 6 + 3 = 18$

$f(-4) = 1$

$f(-2) = 3$

$D: (-\infty, \infty)$

$R: (-\infty, \infty)$



2. $f(x) = \begin{cases} 2x+1 & x \geq 1 \\ x^2+3 & x < 1 \end{cases}$

Function? Yes or No

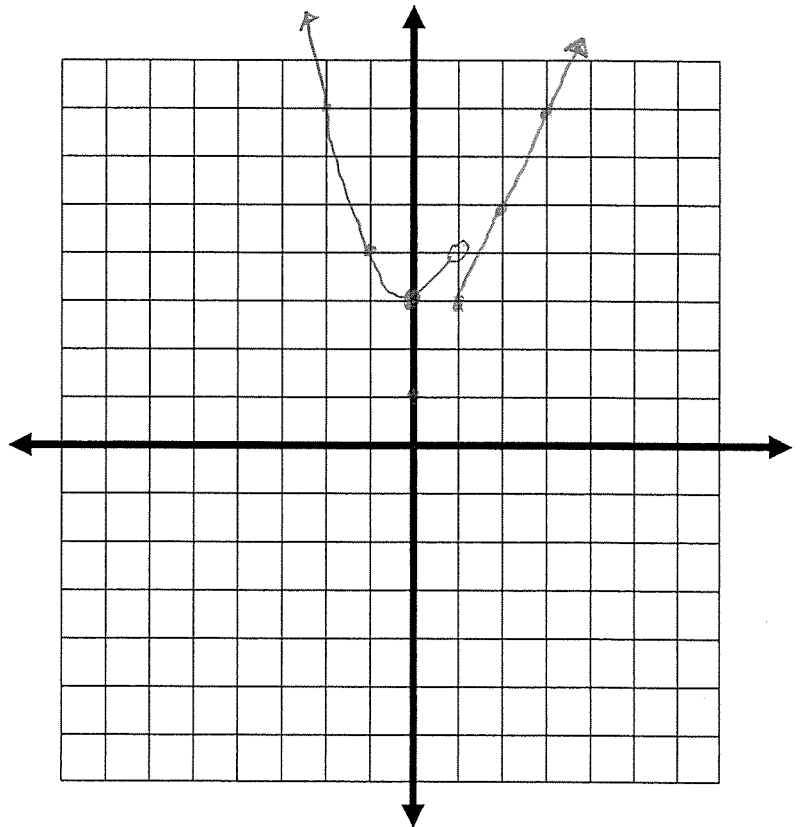
$f(-2) = 7$

$f(6) = 13$

$f(1) = 3$

$D: (-\infty, \infty)$

$R: [3, \infty)$



$$3. \quad f(x) = \begin{cases} -2x + 1 & x \leq 2 \\ 5x - 4 & x > 2 \end{cases}$$

Function? Yes or No

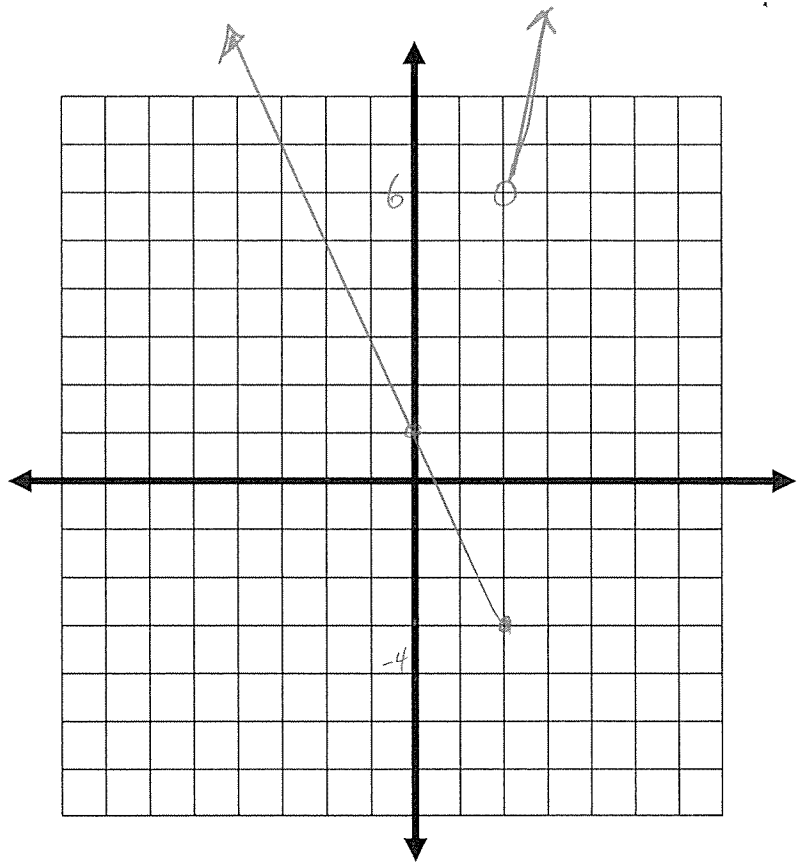
$$f(-4) = 9$$

$$f(8) = 36$$

$$f(2) = -3$$

$$D: (-\infty, \infty)$$

$$R: [-3, \infty)$$



$$4. \quad f(x) = \begin{cases} x^2 - 1 & x \leq 0 \\ 2x - 1 & 0 < x \leq 5 \\ 3 & x > 5 \end{cases}$$

Function? Yes or No

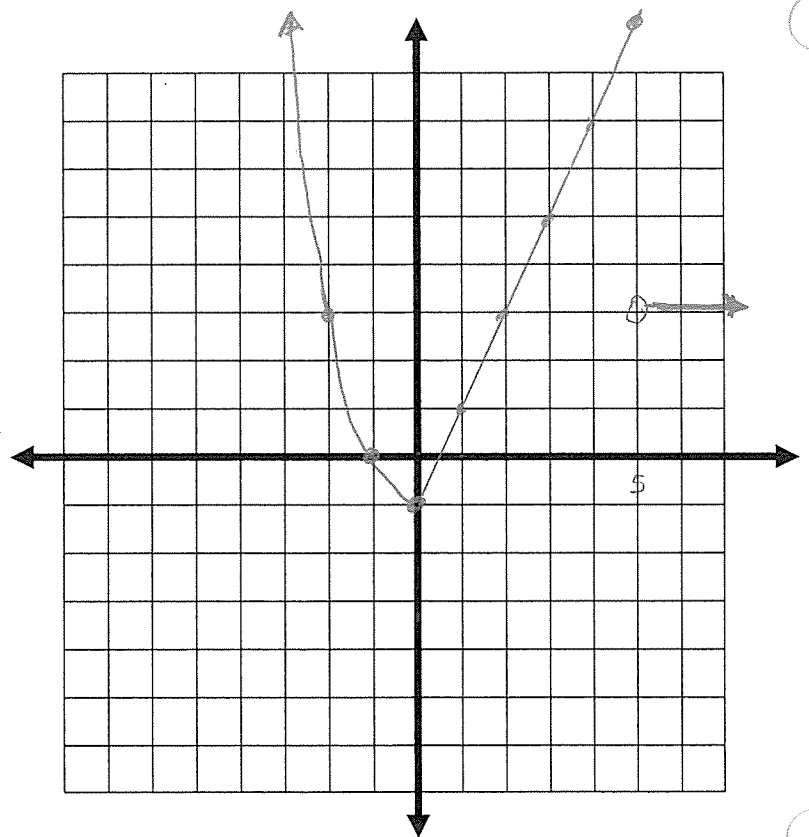
$$f(-2) = 3$$

$$f(0) = -1$$

$$f(5) = 9$$

$$D: (-\infty, \infty)$$

$$R: [-1, \infty)$$



5. $f(x) = \begin{cases} x^2 & x \leq 0 \\ -x^2 + 4 & x > 0 \end{cases}$

Function? Yes or No

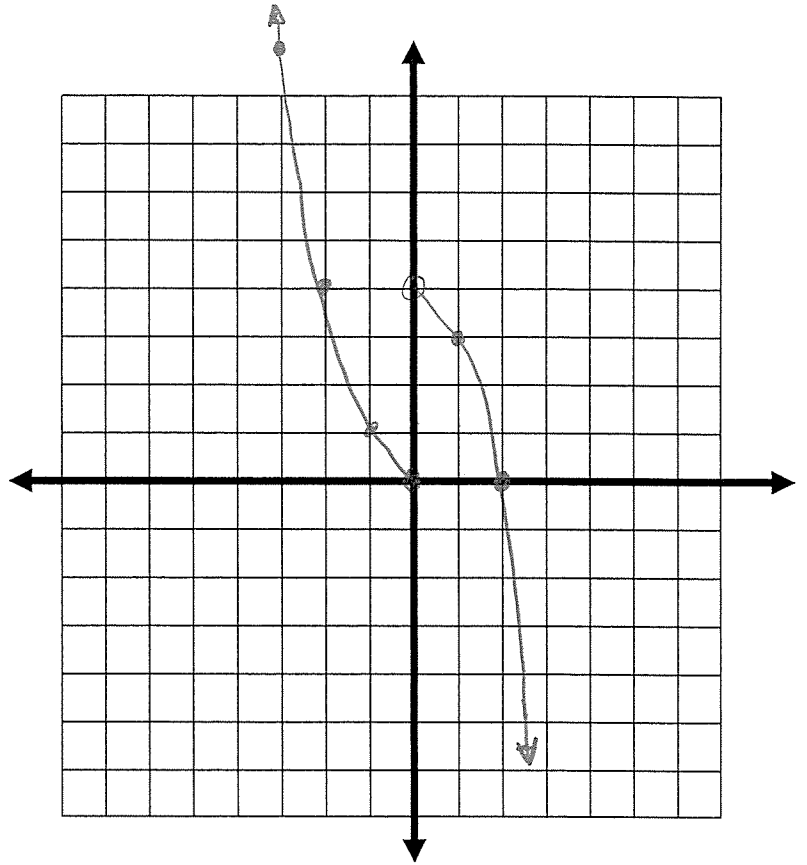
$f(-4) = 16$

$f(0) = 0$

$f(3) = -5$

$D: (-\infty, \infty)$

$R: (-\infty, \infty)$



6. $f(x) = \begin{cases} 5 & x \leq -3 \\ -2x - 3 & x > -3 \end{cases}$

Function? Yes or No

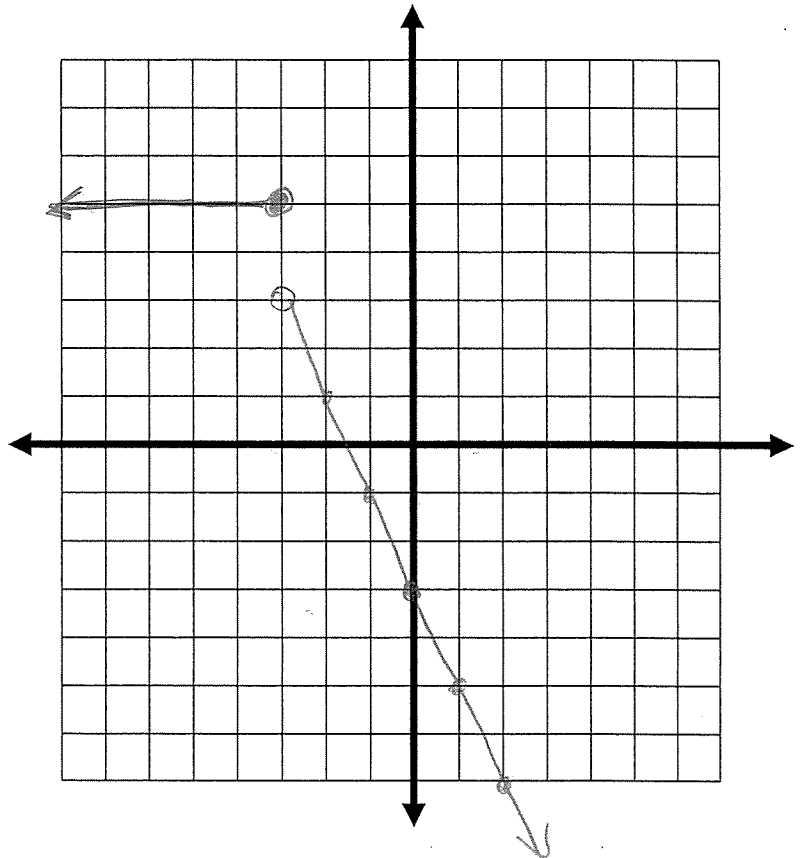
$f(-4) = 5$

$f(0) = -3$

$f(3) = -9$

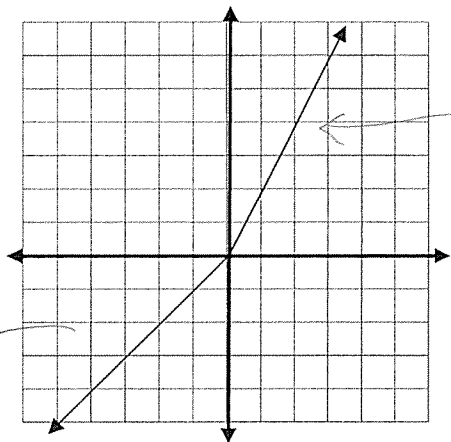
$D: (-\infty, \infty)$

$R: (-\infty, 3) \cup [5]$



Part II. Write equations for the piecewise functions whose graphs are shown below. Assume that the units are 1 for every tic mark.

7.

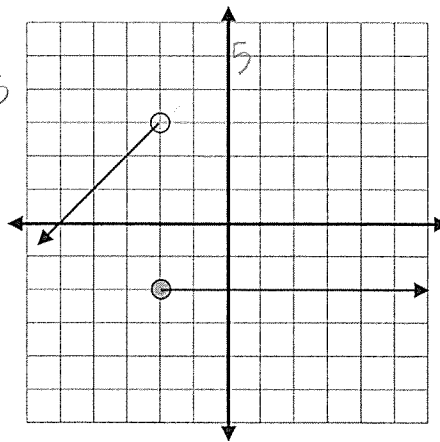


$m = -1$
 $b = 0$

$y - mt = 0$
 $m = 2$
 $y = 2x$

$$f(x) = \begin{cases} -x, & x < 0 \\ 2x, & x \geq 0 \end{cases}$$

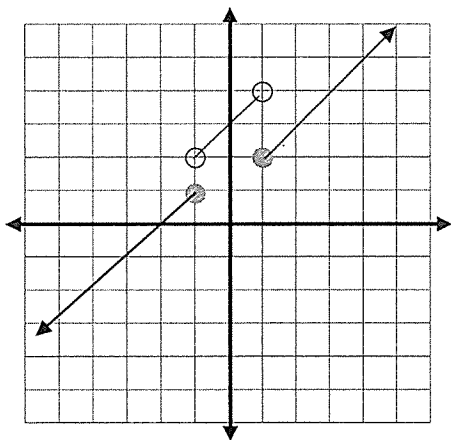
8.



$b = 5$
 $m = 1$

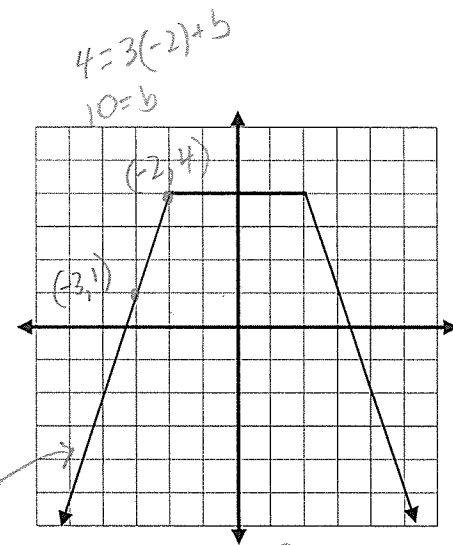
$$f(x) = \begin{cases} x + 5, & x < -2 \\ -2, & x \geq -2 \end{cases}$$

9.



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

10.

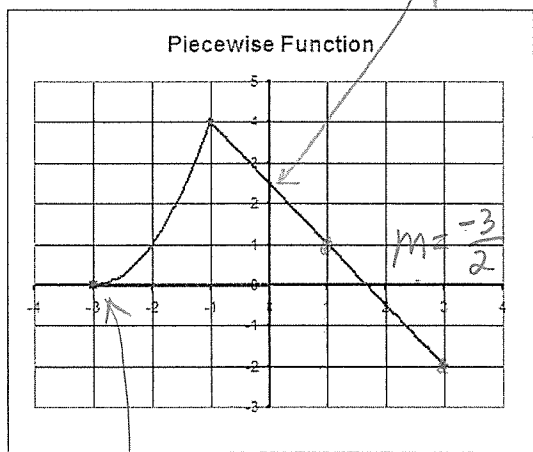


$4 = 3(-2) + b$
 $10 = b$

$m = 3$

$$f(x) = \begin{cases} 3x + 10, & x < -2 \\ 4, & -2 \leq x \leq 2 \\ -3x + 10, & x > 2 \end{cases}$$

11.



$y = 2.5$

$m = \frac{-3}{2}$

$$f(x) = \begin{cases} x^2 + 6x + 9, & -3 \leq x \leq 1 \\ -\frac{3}{2}x + 2\frac{1}{2}, & x > 1 \end{cases}$$

vertex $(-3, 0) \rightarrow x = -3 \quad (x+3)(x+3)$

$$\textcircled{1} \quad 1 < |x-4| < 3$$

$$1 < |x-4| \quad \text{and} \quad |x-4| < 3$$

OR

$$x-4 > 1 \quad \text{or} \quad x-4 < -1$$

$$\textcircled{x > 5 \quad \text{or} \quad x < 3}$$

$$x-4 < 3 \quad \text{and} \quad x-4 > -3$$

$$\textcircled{x < 7 \quad \text{and} \quad x > 1}$$

$$1 < x < 7$$



$$(1 < x < 3) \quad \text{or} \quad (5 < x < 7)$$

$$\textcircled{2} \quad 2 \leq |x+1| \leq 5$$

$$\text{Ans: } \left\{ \begin{array}{l} x: -6 \leq x \leq -3 \quad \text{or} \\ 1 \leq x \leq 4 \end{array} \right\}$$

$$\textcircled{3} \quad 2 \leq |x-1| \leq 5$$

Ans

$$(3 \leq x \leq 6) \text{ or } (-4 \leq x \leq -1)$$