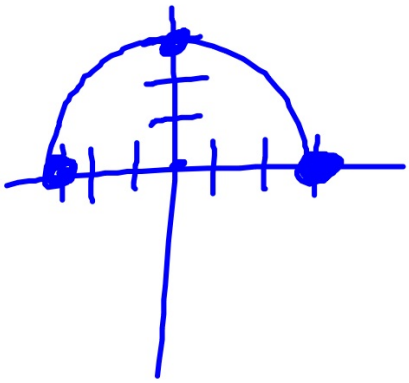
5. $y = \sqrt{9 - x^2}$

semicircle

$r = 3$



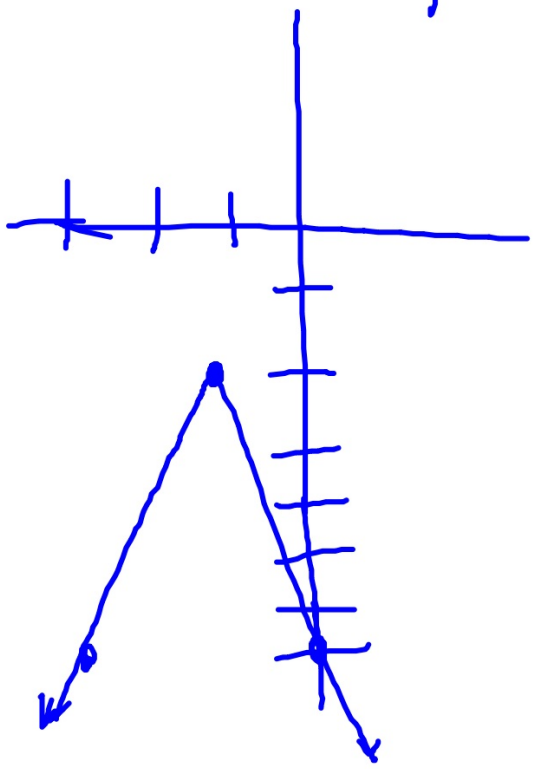
D: $[-3, 3]$

R: $[0, 3]$

9. $f(x) = -|3x+5| - 2$

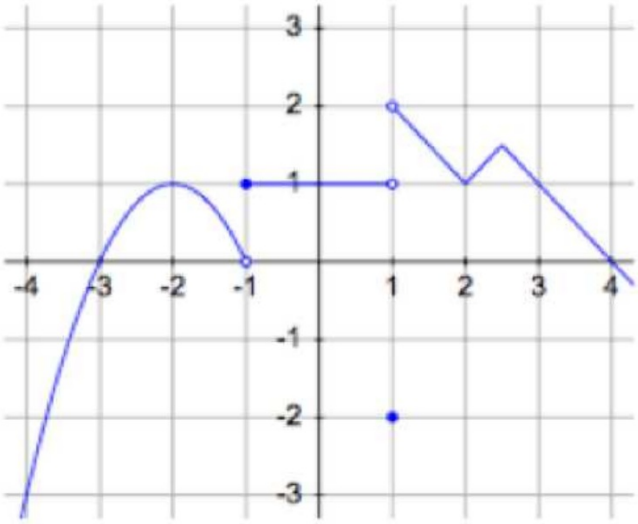
$f(x) = -|3(x+\frac{5}{3})| - 2$

x	y
0	-7
$-5/3$	-2
$-10/3$	-7



Piecewise Functions

A piecewise function is a function defined by multiple sub-functions.



*See printout.

ex: Evaluate.

$$f(x)=\begin{cases} 8x-1, & x<0 \\ -18, & 0\le x<5 \\ 3x^{-2}, & x\ge 5 \end{cases}$$

a) $f(-3) = 8(-3)-1 = -25$

b) $f(6) = 3(6)^{-2} = \frac{1}{12}$

c) $f(0) = -18$

ex: Evaluate.

$$g(x)=\begin{cases}|2x-1|, & x>6\\ \dfrac{1}{x}, & 1<x\le 6\\ x^3, & x=1\end{cases}$$

a) $g\left(\frac{5}{4}\right) = \frac{4}{5}$

b) $g(1) = 1$

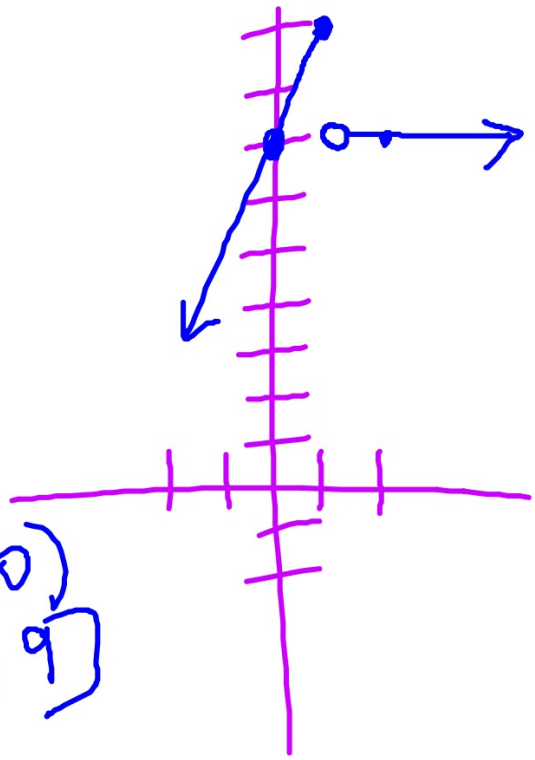
c) $g(0)$ undefined

d) $g(10)$ 19

ex: Sketch and state the D/R.

a) $f(x)=\begin{cases} 2x+7, & x \le 1 \\ 7, & x > 1 \end{cases}$

$2x+7$	7
• $(1, 9)$	∘ $(1, 7)$
• $(0, 7)$	• $(2, 7)$



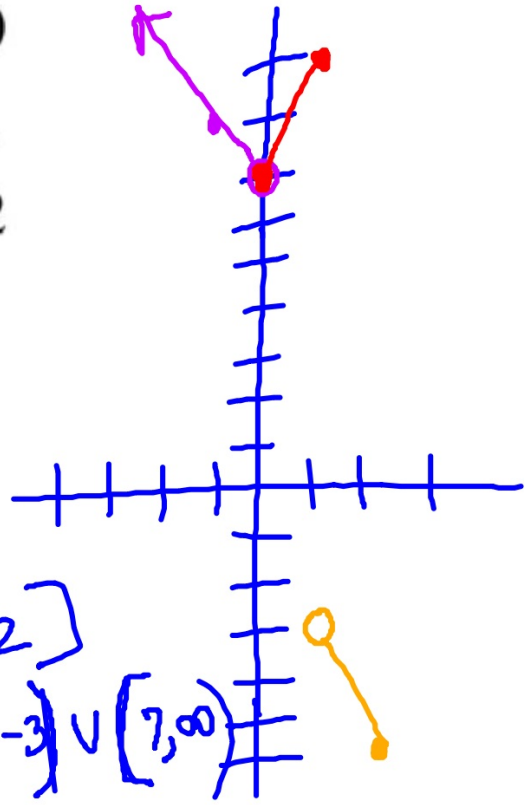
D: $(-\infty, \infty)$

R: $(-\infty, 9]$

ex: Sketch and state the D/R.

b) $g(x) = \begin{cases} -x+7, & x<0 \\ 2x+7, & 0 \le x \le 1 \\ -3x, & 1 < x \le 2 \end{cases}$

$-x+7$	$2x+7$	$-3x$
$\circ(0,7)$	$\bullet(0,7)$	$\circ(1,-3)$
$\bullet(-1,8)$	$\bullet(1,9)$	$\bullet(2,-6)$



D: $(-\infty, 2]$

R: $[-6,-3) \cup [7,\infty)$

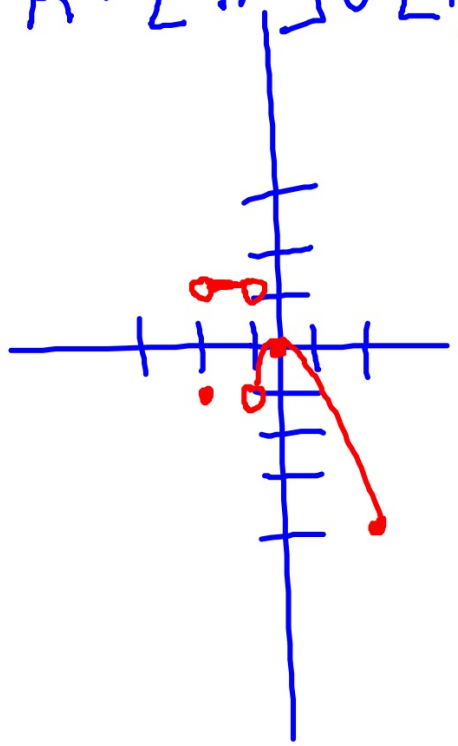
ex: Sketch and state the D/R.

c) $$y = \begin{cases} \dfrac{2}{x}, & x = -2 \\ 1, & -2 < x < -1 \\ -x^2, & -1 < x \le 2 \end{cases}$$

$\frac{2}{x}$	1	$-x^2$
$(-2,-1)$	o $(-2,1)$	o $(-1,-1)$
	o $(-1,1)$	• $(0,0)$
		• $(2,-4)$

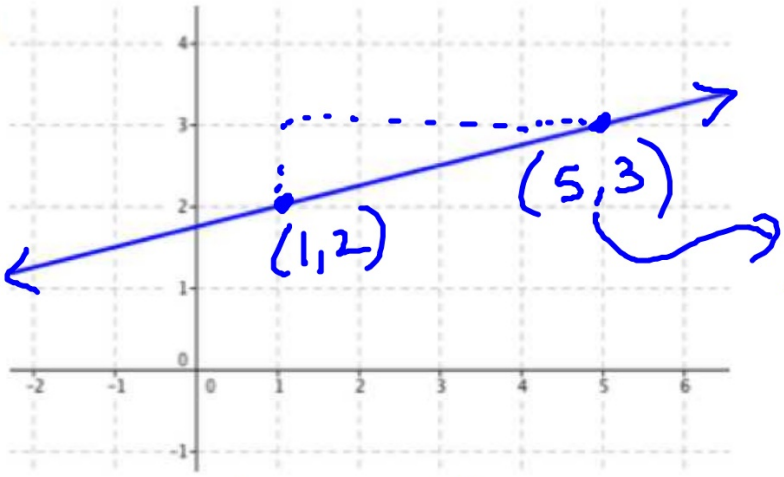
D: $[-2,-1) \cup (-1,2]$

R: $[-4,0] \cup [1]$



ex: Write the equation.

a)



$y = mx + b$

$m = \frac{1}{4}$

$3 = \frac{1}{4}(5) + b$

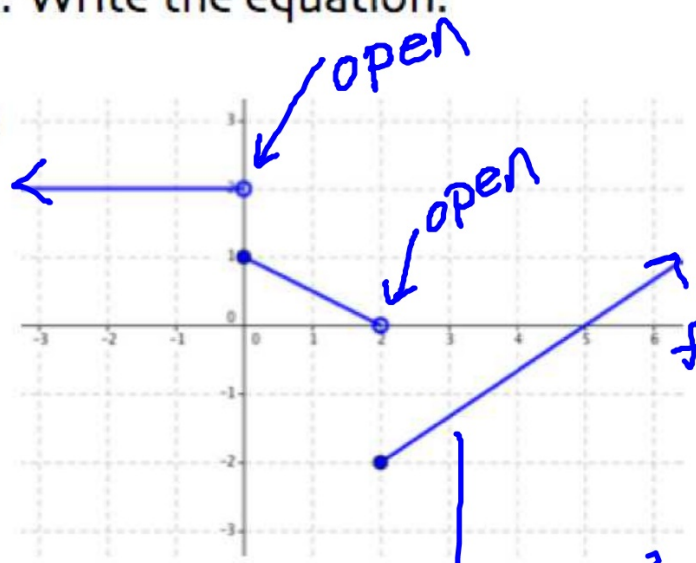
$3 - \frac{5}{4} = b$

$\frac{7}{4} = b$

$y = \frac{1}{4}x + \frac{7}{4}$

ex: Write the equation.

b)



$$f(x) = \begin{cases} 2, & x < 0 \\ \frac{-1}{2}x + 1, & 0 \le x < 2 \\ \frac{2}{3}x - \frac{10}{3}, & x \ge 2 \end{cases}$$

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

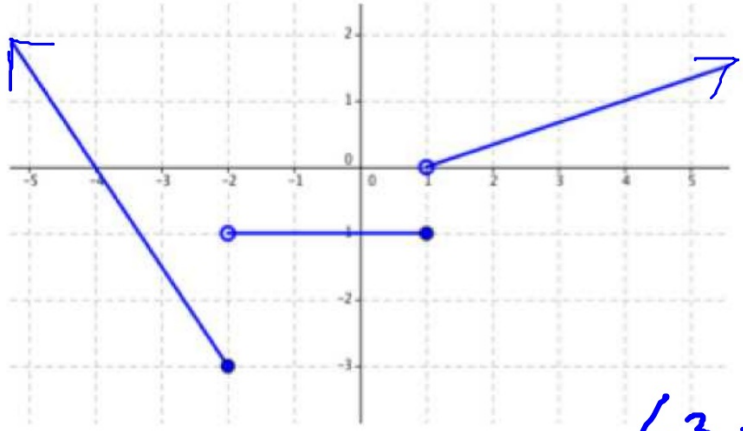
$(2, -2)$

$-2 = \frac{2}{3}(2) + b$

$\frac{-10}{3} = b$

ex: Write the equation.

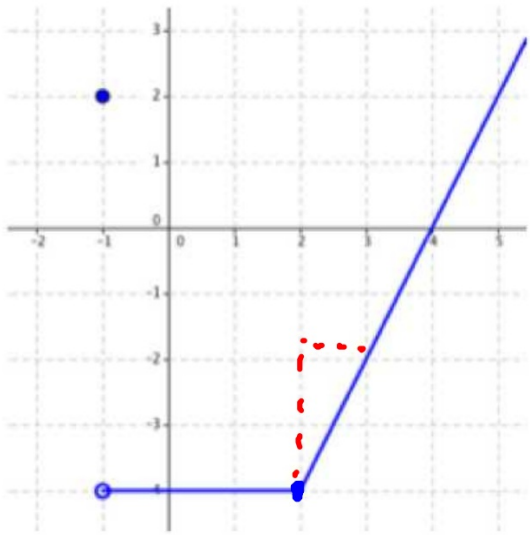
c)



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

ex: Write the equation.

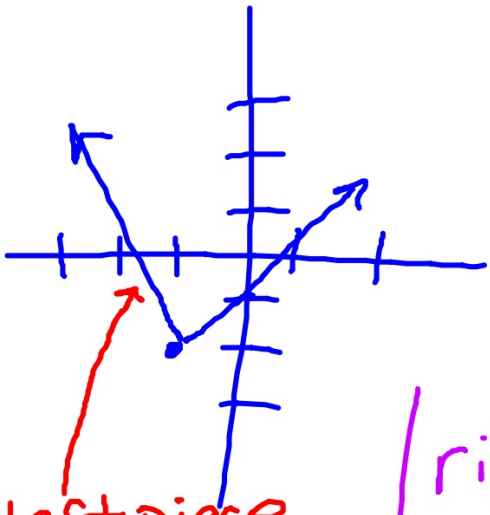
d)



$$f(x) = \begin{cases} 2, & x = -1 \\ -4, & -1 < x \leq 2 \\ 2x - 8, & x > 2 \end{cases}$$

ex: Rewrite as a piecewise function.

a) $y = |x+1| - 2$



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

left piece

$m = -1$

$(-1, -2)$

$-2 = (-1)(-1) + b$

$-3 = b$

right piece

$m = 1$

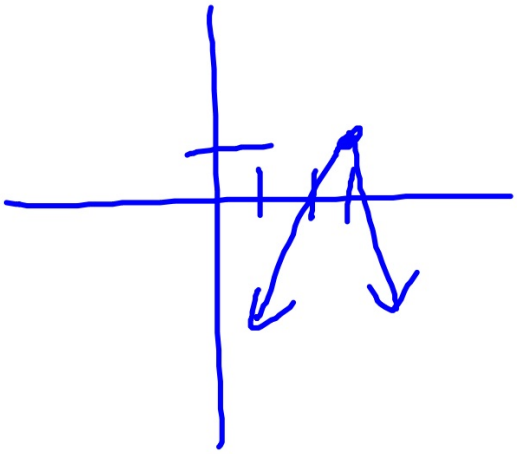
$(-1, -2)$

$-2 = (-1)(1) + b$

$-1 = b$

ex: Rewrite as a piecewise function.

b) $y = -2|x-3|+1$



$$f(x) = \begin{cases} 2x-5, & x \le 3 \\ -2x+7, & x > 3 \end{cases}$$