Warm Up

1) Write an equation with triple the amplitude and half the period:

$y = 4\cos(6x) + 12$

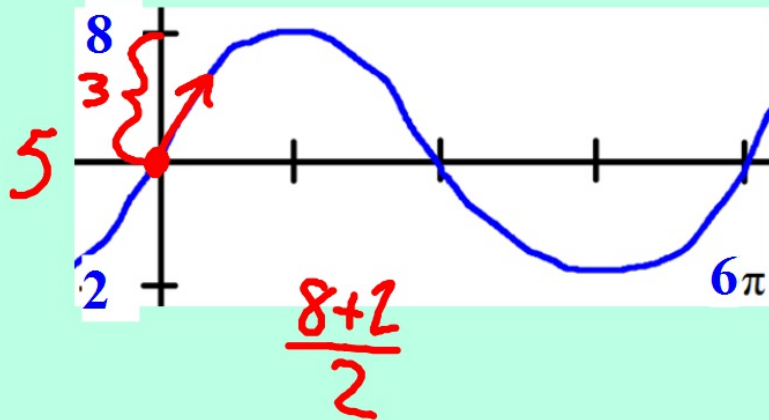$\times 3$

$y = 12\cos(12x)$

$Per = \dfrac{2\pi}{b}$

$\dfrac{2\pi}{6} = \dfrac{\pi}{3} \cdot \dfrac{1}{2} = \dfrac{\pi}{6}$

$\dfrac{2\pi}{\frac{\pi}{6}} = \dfrac{2}{\frac{1}{6}} = 12$

2) What is the phase shift of:

$y = 3\sin(8x + 12) - 4$

$PS = \dfrac{-c}{b}$

$\dfrac{-12}{8} = \boxed{-\dfrac{3}{2} \text{ or } -1.5}$

3) Write an equation for the following graph:

$y = 3\sin\left(\dfrac{1}{3}x\right) + 5$

$\dfrac{8+2}{2}$

$\dfrac{2\pi}{6\pi}$

Part I. Carefully graph each of the following. Then, evaluate the graph at any specified domain value.

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

$(-2, 3)$ $(-2, 3)$

$-2+5=3$ $-2(-2)-1=3$

$(-3, 2)$ $(-1, 1)$

$-3+5=2$ $-2(-1)-1=1$

$f(3) = $ **-7**

$f(-4) = $ **1**

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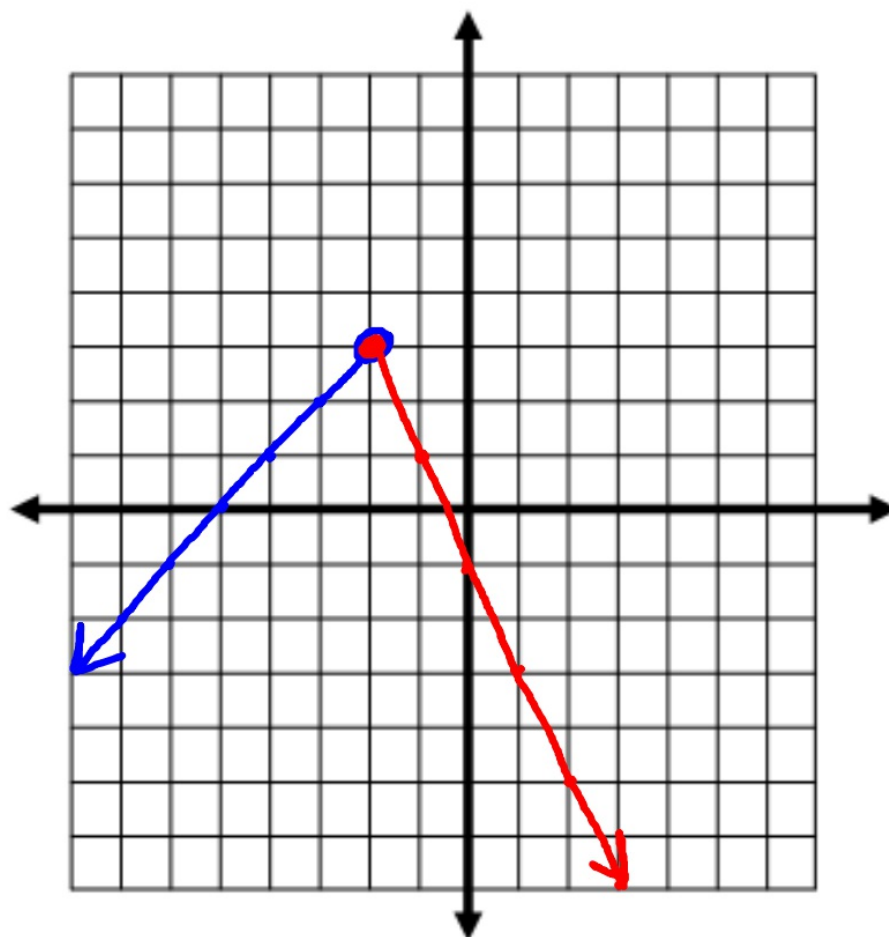
2. $f(x) = \begin{cases} 2x+1 & x \geq 1 \\ \dfrac{1}{2}x - 3 & x < 1 \end{cases}$

$2(1) + 1 = 3$

$(1, 3)$

$2(2) + 1 = 5$

$(2, 5)$

$\dfrac{1}{2}(1) - 3 = -2.5$

$(1, -2.5)$

$\dfrac{1}{2}(0) - 3 = -3$

$(0, -3)$

$f(-2) = $ **-4**

$f(6) = $ **13**

$f(1) = $ **3**

3.

$$f(x) = \begin{cases} 4x - 2 & x \geq 3 \\ -\dfrac{x}{3} + 4 & x < 3 \end{cases}$$
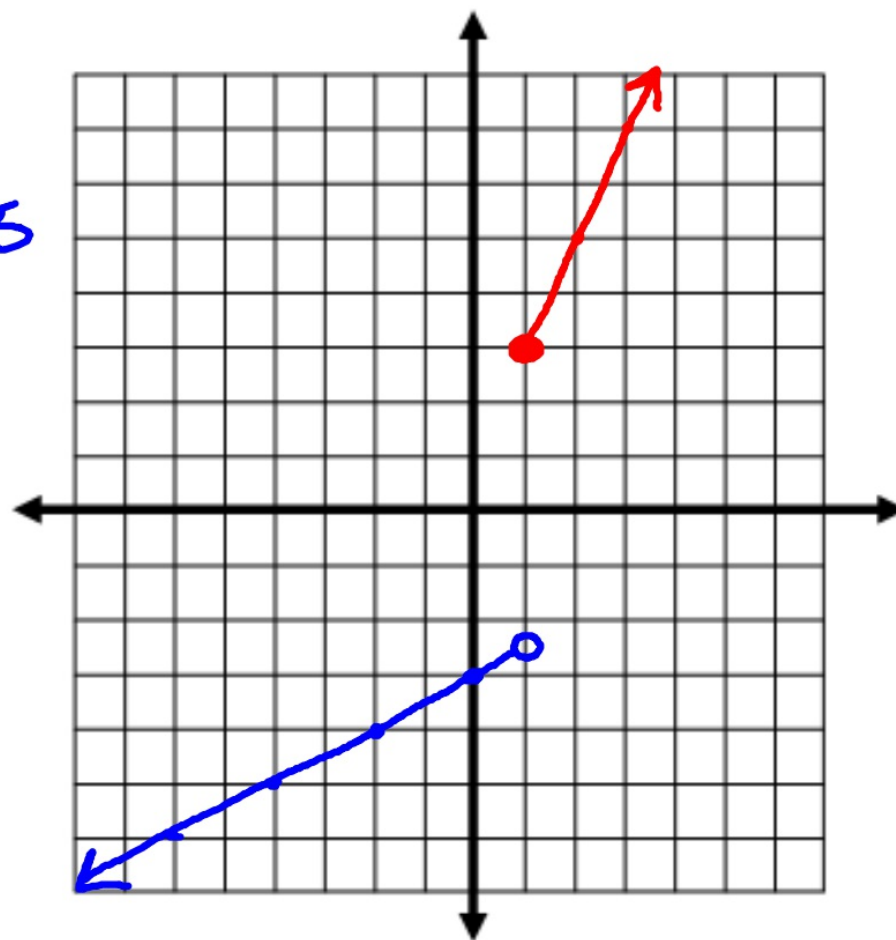
$f(-4) = $ **16/3**

$f(8) = $ ~~30~~ **6**

$f(2) = $ ~~6~~ **10/3**

3. $f(x) = \begin{cases} 4x - 2 & x \geq \underline{2}\,3 \\ -\dfrac{x}{3} + 4 & x < \underline{2}\,3 \end{cases}$
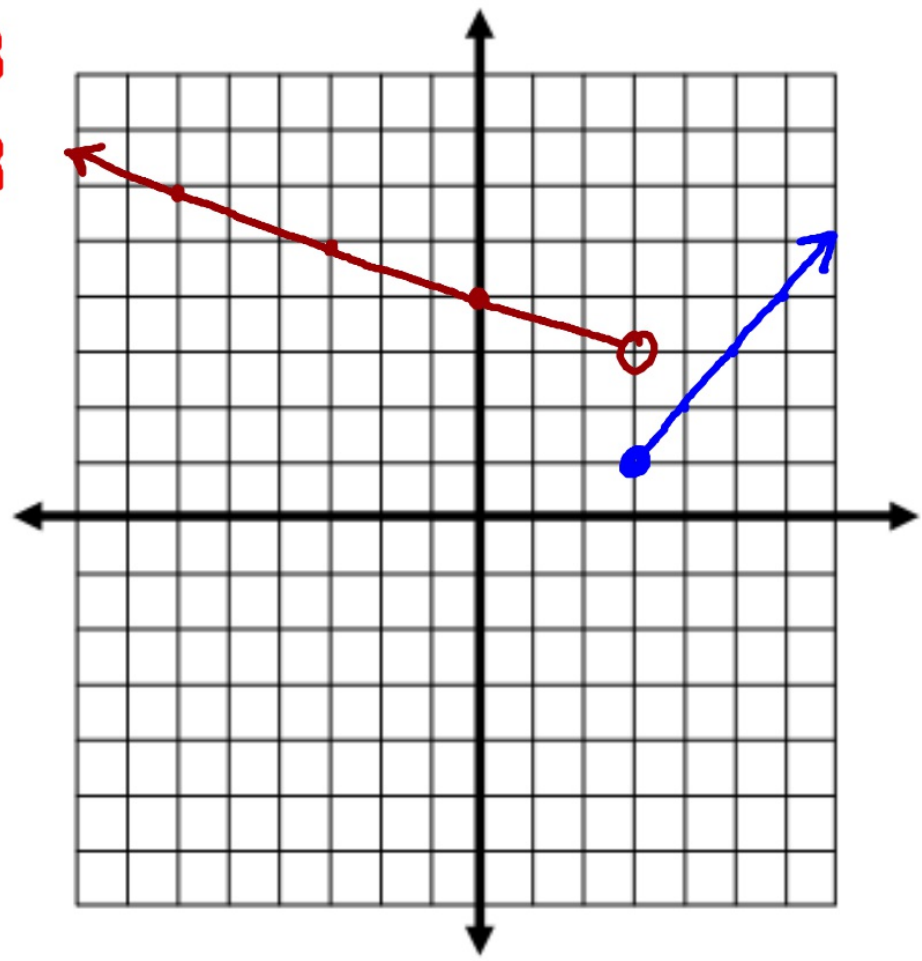
$(3, 1)$

$3 - 2 = 1$

$(4, 2)$

$4 - 2 = 2$

$(3, 3)$

$-\dfrac{3}{3} + 4 = 3$

$(0, 4)$

$-\dfrac{0}{3} + 4 = 4$

4.
$$\begin{cases} -x+4 & x \le 0 \\ \dfrac{2}{3}x - 1 & 0 < x \le \cancel{5}\,6 \\ 2 & x > \cancel{5}\,6 \end{cases}$$
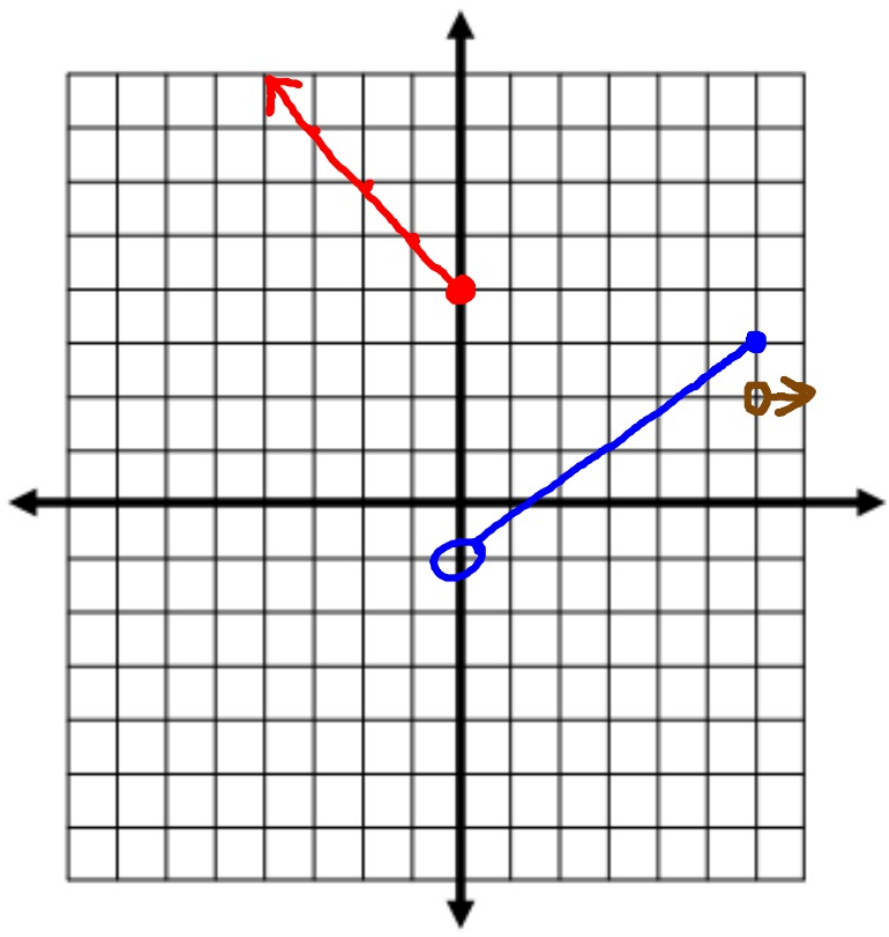
$(0, 4)$
$-0 + 4 = 4$

$(-1, 5)$
$-(-1) + 4 = 5$

$\dfrac{2}{3}(0) - 1 = -1$
$(0, -1)$

$f(-2) = $ **6**

$(6, 2)$

$f(0) = $ **4**

$f(5) = $ **7/3**

5. $f(x) = \begin{cases} -x+1 & x \leq \underline{0} \\ \dfrac{-4}{3}x - 4 & x > \underline{0} \end{cases}$

$-0+1 = 1$

$(0,1)$

$-(-1)+1 = 2$

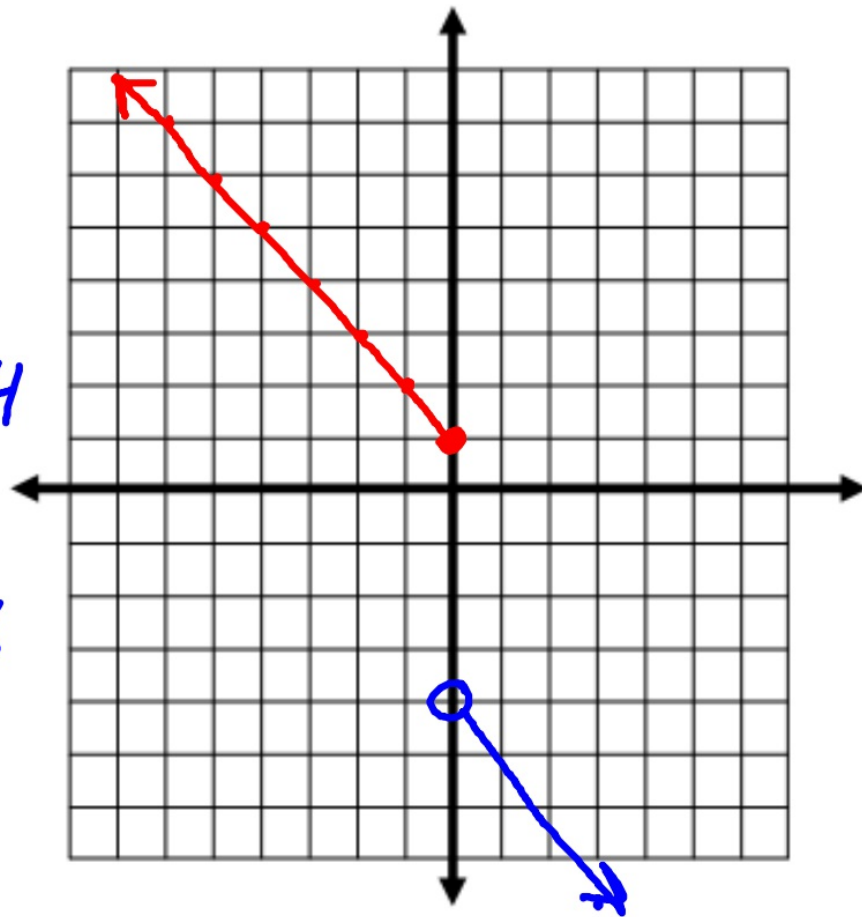$(-1,2)$

$(0,-4)$

$\dfrac{-4}{3}(0) - 4 = -4$

$(3,-8)$

$\dfrac{-4}{3}(3) - 4 = -8$

$f(-4) = $ **5**
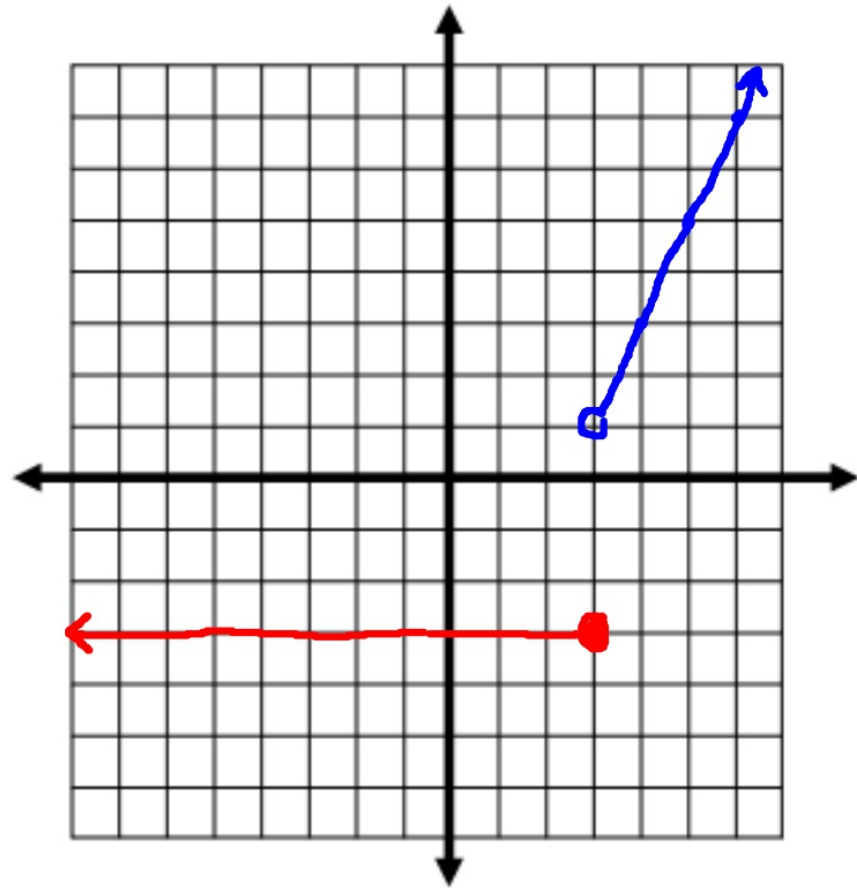
$f(0) = $ **1**

$f(3) = $ **-8**

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

$f(-4) = $ **-3**

$f(0) = $ **-3**

$f(3) = $ **-3**

Unit 5: Functions

Piecewise Functions

Function Values   Graphing

In order for a piecewise function to be continuous the shared x-value endpoints must match up.

What value of d would make the function continuous?

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

Make Endpoints Match

$2(3) + 5 = -3 + d$

$11 = -3 + d$

$+3 \quad\quad +3$

$\boxed{14 = d}$

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

$3(1) + d = 1^2 + 5$

$3 + d = 6$

$-3 \quad\quad -3$

$\boxed{d = 3}$

$$f(x) = \begin{cases} dx - 4, & x < -2 \\ |5x|, & x \geq -2 \end{cases}$$

$d(-2) - 4 = |5(-2)|$

$-2d - 4 = 10$

$-2d = 14$

$\boxed{d = -7}$

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

Continuous: (Yes) No

Domain: $\mathbb{R}$ Range: $\mathbb{R}$

$(-2, 3)$ $(-3, 2)$

$-2 + 5 = 3$ $-3 + 5 = 2$

$(-2, 3)$
$(-1, 2)$ table
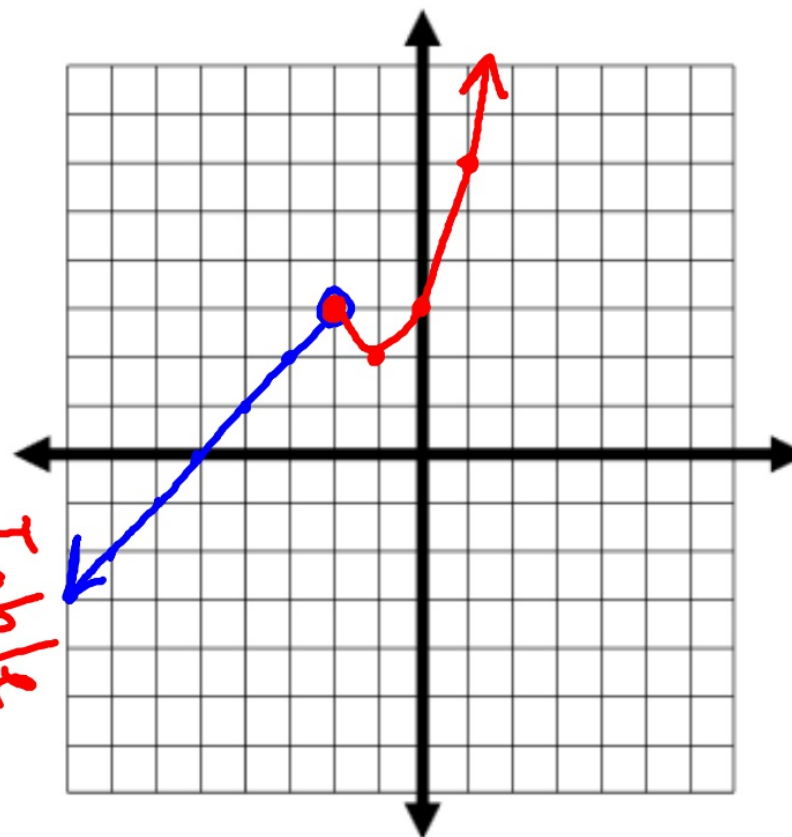$(0, 3)$
$(1, 6)$

$f(3) = 3^2 + 2(3) + 3 = \boxed{18}$

$f(-4) = -4 + 5 = \boxed{1}$

$f(-2) = \boxed{3}$

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

Continuous: Yes (No)

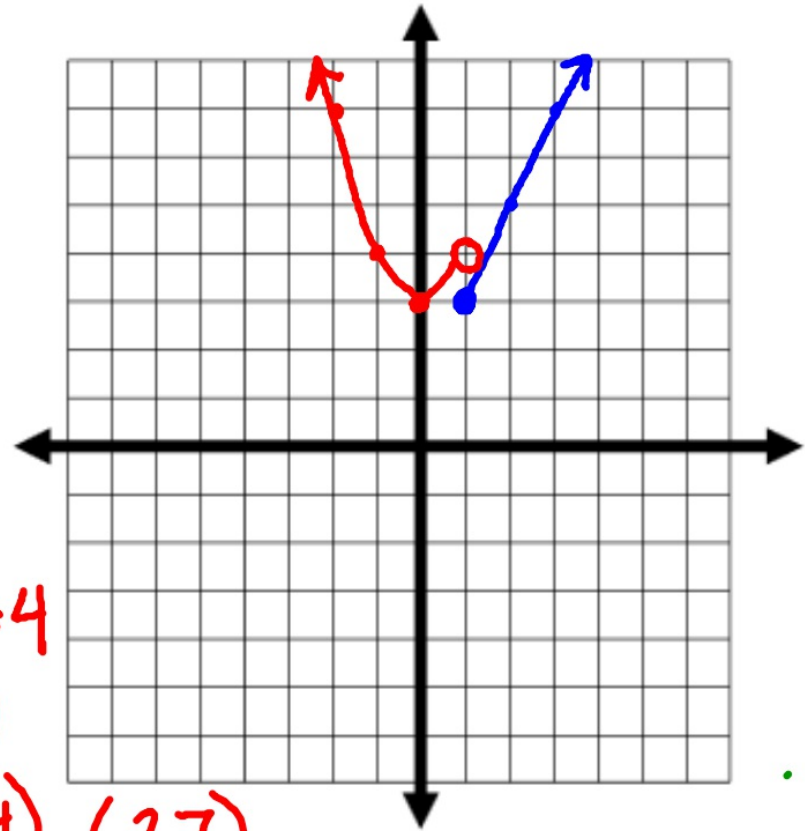Domain: $\mathbb{R}$ Range: $y \geq 3$

(1, 3)   (2, 5)   (1,4)

$2(1)+1=3$ $2(2)+1=5$ $1^2+3=4$

(0,3)

(-1,4) (-2,7)

$f(-2) = (-2)^2 + 3 = \boxed{7}$

$f(6) = 2(6)+1 = \boxed{13}$

$f(1) = 2(1)+1 = \boxed{3}$

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

Continuous: Yes ~~No~~

Domain: $\mathbb{R}$ Range: $y \geq -3$

$(2, -3)$ $(1, -1)$ $(2, 6)$
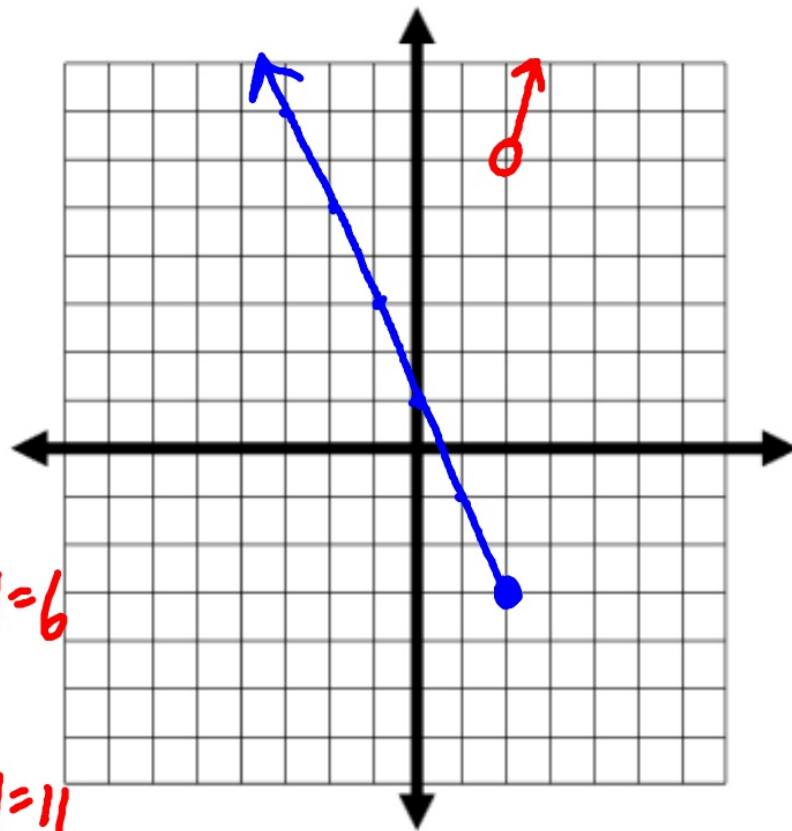$-2(2) + 1 = -3$ $-2(1) + 1 = -1$ $5(2) - 4 = 6$
                                      $(3, 11)$
                                      $5(3) - 4 = 11$

$f(-4) = 9$

$f(8) = 36$

$f(2) = -3$

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

Continuous: Yes ~~No~~

Domain: $\mathbb{R}$ Range: $y \ge -1$

$(0, -1)$ $(-1, 0)$ $(0, -1)$

$0^2 - 1 = -1$ $(-2, 3)$ $2(0) - 1 = -1$

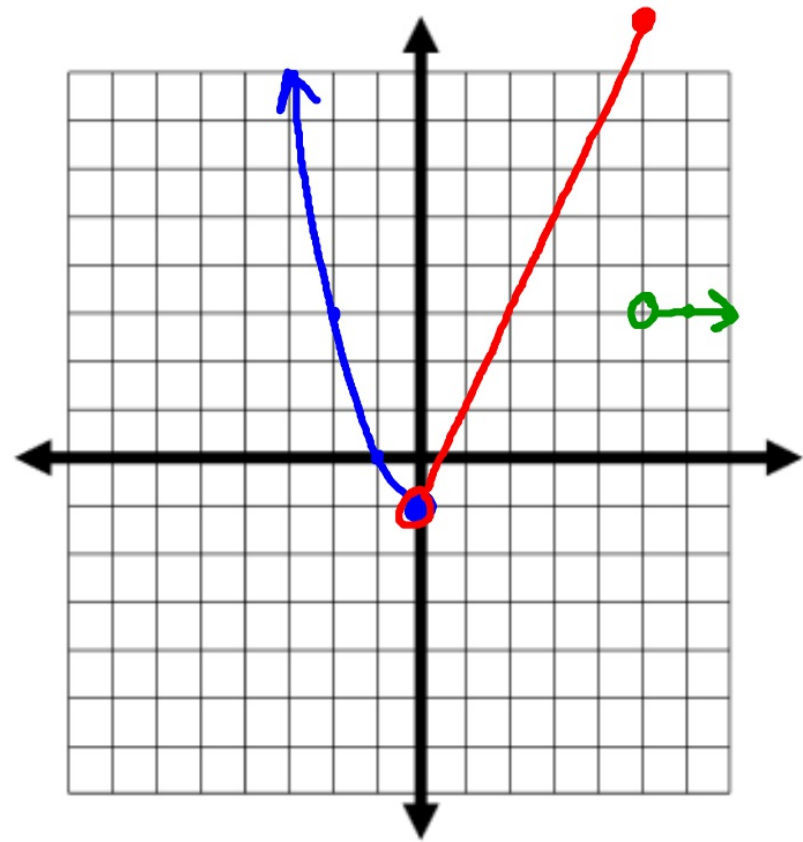$(-3, 8)$ $(5, 9)$

$2(5) - 1 = 9$

$f(-2) = 3$

$f(0)^- = -1$

$f(5) = 9$

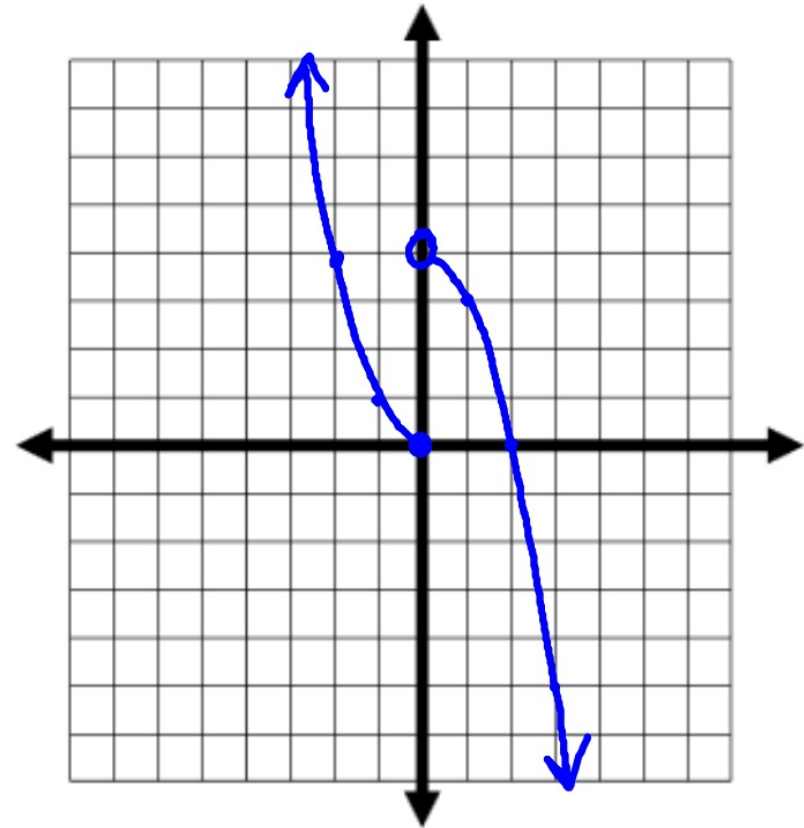5. $f(x) = \begin{cases} x^2 & x \le 0 \\ -x^2 + 4 & x > 0 \end{cases}$

Continuous: Yes (No)

Domain: $\mathbb{R}$ Range: $\mathbb{R}$

$f(-4) = 16$

$f(0) = 0$

$f(3) = -5$

6. $f(x) = \begin{cases} 5 & x \le -3 \\ -2x - 3 & x > -3 \end{cases}$
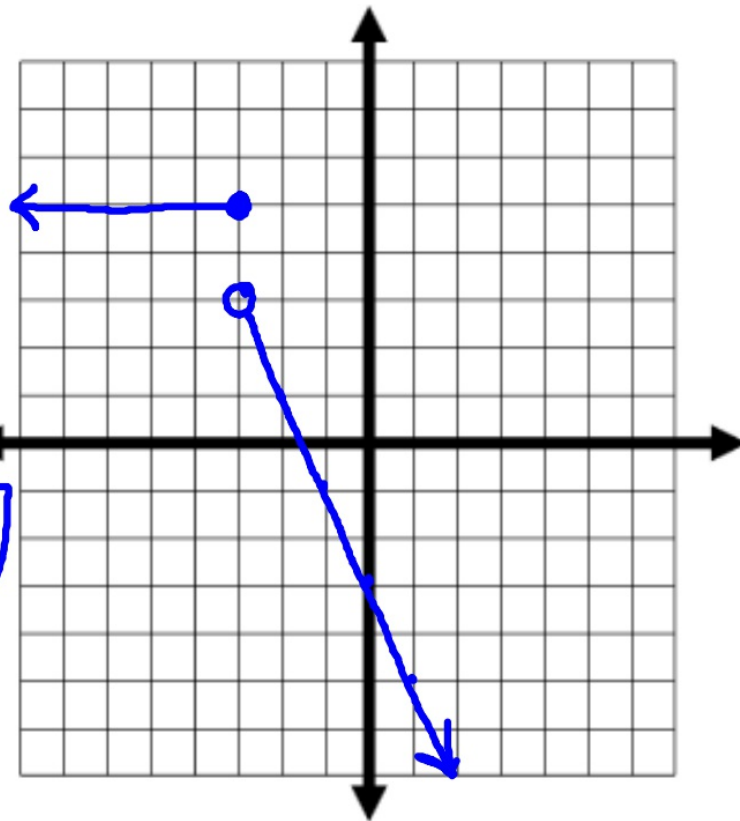
Continuous: Yes (No)

Domain: $\mathbb{R}$ Range: $y < 3$ or $y = 5$

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

$f(-4) = 5$

$f(0) = -3$

$f(3) = -9$

Assignment::
WB 511 #7-10
E.C. for All