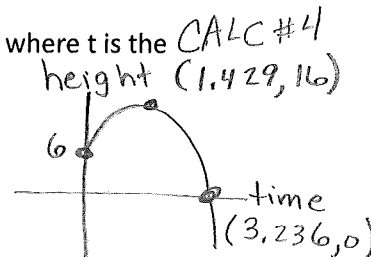


Show all work for credit.

1. If a Frisbee is thrown from a second story dorm room window 6 meters high with an initial velocity of 14 m/s, then the height of the Frisbee can be modeled by  $h(t) = -4.9t^2 + 14t + 6$ , where  $t$  is the number of seconds after the Frisbee is thrown.



4 a. What is the maximum height of the Frisbee? Round answer to three decimal places.

max height = 16 meters

$y = -4.9x^2 + 14x + 6$  CALC#5  
 $y = 0$

4 b. When does the Frisbee reach its maximum height? Round answer to three decimal places.

time to max height = 1.429 seconds

4 c. When does the Frisbee hit the ground? Round answer to three decimal places.

ground level in 3.236 seconds

4 d. What is the domain of this function?

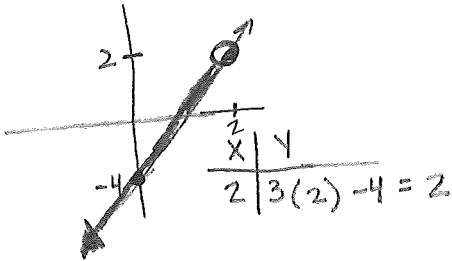
$(-\infty, \infty)$   
or  
 $[0, 3.236]$

2. Given the piecewise function,  $f(x) = \begin{cases} 3x - 4; & x < 2 \\ -x + 6; & x \geq 2 \end{cases}$

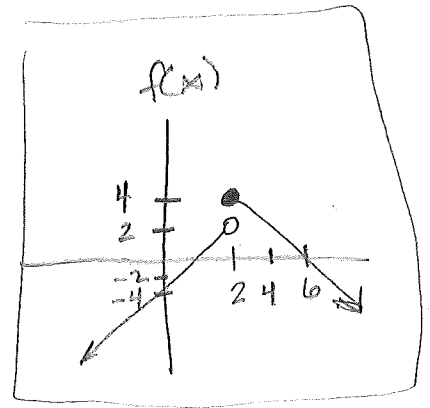
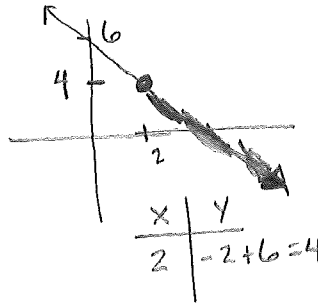
a. Sketch the graph of the piecewise function.

(4)

$$y = 3x - 4$$



$$y = -x + 6$$



(4)

b. Find the value of  $f(2)$  and  $f(1)$ .

$$f(2) = -2 + 6 = 4$$

$$f(1) = 3(1) - 4 = -1$$

c. What is the range of this function?

(4)

$$(-\infty, 4]$$

3. a. Write the formula of the translated function  $g(x)$  that has moved left 4 units, reflected about the x-axis, and moved down 2 units from the base function  $f(x) = \sqrt{x}$ .

(6)

$$g(x) = -\sqrt{x + 4} - 2$$

(6)

b. Given the table of  $f(x)$ , construct a table of  $g(x) = \frac{1}{2}f(x - 3)$ .

x	f(x)
5	3
1	1

x	g(x)
8 = 5 + 3	3/2 = 1.5
4 = 1 + 3	1/2 = 0.5

right 3 (x+3)  
shrink y (1/2 y)

x	g(x)
8	1.5
4	0.5

4. Given  $f(x) = 3x + 5$  and  $g(x) = |4x - 2| + 1$ , find

(3) a.  $(f+g)(x) = 3x+5 + |4x-2|+1 = \boxed{3x+6+|4x-2|}$

(3) b.  $(f/g)(2) = \left( \frac{3x+5}{|4x-2|+1} \right)_{x=2} = \frac{3(2)+5}{|4(2)-2|+1} = \frac{6+5}{8-2+1} = \boxed{\frac{11}{7}}$

(3) c.  $(f \circ g)(x) = f(g(x)) = 3(|4x-2|+1) + 5 = 3|4x-2| + 3 + 5 = \boxed{3|4x-2| + 8}$

(3) d.  $f^{-1}(x) =$

$x = 3y + 5$

$x - 5 = 3y$

$\boxed{\frac{x-5}{3} = y = f^{-1}(x)}$

5. Solve algebraically  $\sqrt{4x^2 - 7} = x - 1$

(12)  $(\sqrt{4x^2 - 7})^2 = (x-1)^2$  FOIL!

$4x^2 - 7 = (x-1)(x-1)$

$4x^2 - 7 = x^2 - 2x + 1$

$3x^2 + 2x - 8 = 0$

$(3x+4)(x-2) = 0$

$\boxed{x = \frac{4}{3}}$   ~~$x = 2$~~  check!

if  $x = 4/3$

$\sqrt{4(\frac{4}{3})^2 - 7} = \frac{4}{3} - 1$

$\sqrt{4(\frac{16}{9}) - 7} = \frac{1}{3}$

$\sqrt{\frac{64}{9} - 7} = \frac{1}{3}$

$\sqrt{\frac{64}{9} - \frac{63}{9}} = \frac{1}{3}$

$\sqrt{\frac{1}{9}} = \frac{1}{3}$  😊

if  $x = -2$

$\sqrt{4(-2)^2 - 7} = -2 - 1$

$\sqrt{16 - 7} = -3$

$\sqrt{9} = -3$  😞

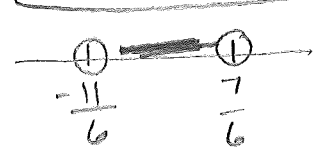
(12) 6. Solve algebraically  $2|3x+1| - 4 < 5$

$x = -3$   $12 < 5$  (A)

$x = 0$   $-2 < 5$  (B)

$x = 2$   $10 < 5$  (A)

$\boxed{(-\frac{11}{6}, \frac{7}{6})}$



$+4 \quad +4$

$\frac{2|3x+1|}{2} < \frac{9}{2}$

$|3x+1| < \frac{9}{2}$

$3x+1 = \frac{9}{2}$   
 $-1 \quad -1$

$\frac{3x}{3} = \frac{7}{2}$   
 $x = \frac{7}{2} // 6$

$3x+1 = -\frac{9}{2}$   
 $-1 \quad -1$

$\frac{3x}{3} = -\frac{11}{2}$   
 $x = -\frac{11}{2} // 6$

7. A political candidate wishes to use a combination of  $x$  television ads and  $y$  radio ads for her campaign. Each 1-minute TV ad reaches 0.10 million eligible voters, while each 1-minute radio ad reaches 0.005 million eligible voters. The candidate feels she must reach at least 4.2 million eligible voters and that she must purchase at least 80 minutes of advertisements.

a. Write the system of inequalities that describe the scenario.

(6)

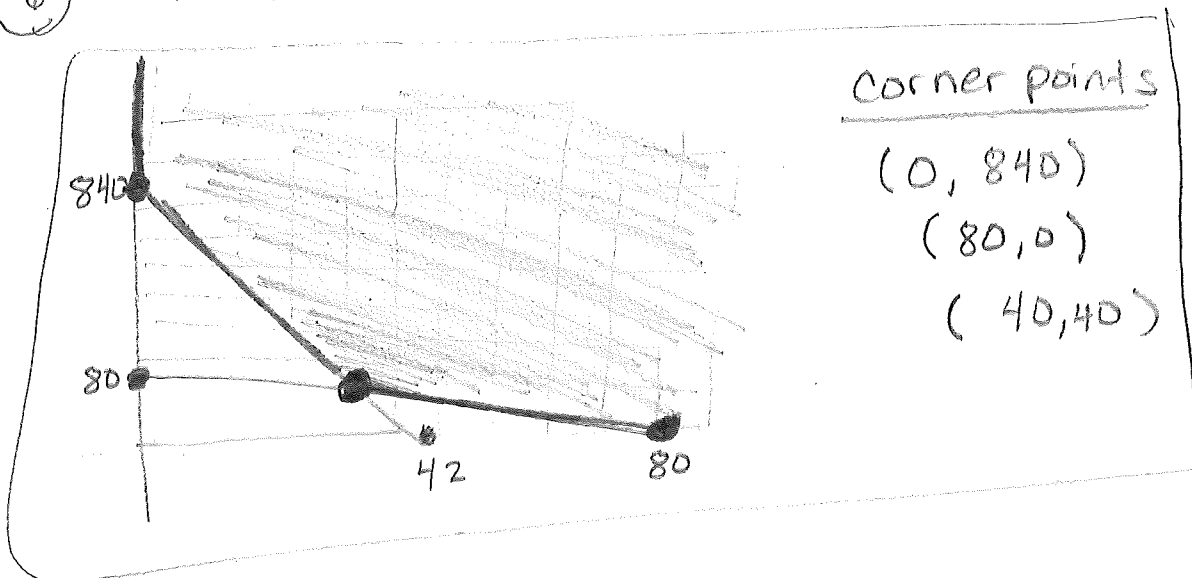
$$\begin{cases} 0.10x + 0.005y \geq 4.2 \\ x + y \geq 80 \\ x \geq 0 \\ y \geq 0 \end{cases}$$

$$\begin{cases} 0.10x + 0.005y = 4.2 \\ x + y = 80 \end{cases}$$

$$\begin{array}{r} -0.10 \\ \hline 0.10x + 0.005y = 4.2 \\ + -0.10x - 0.10y = -8 \\ \hline -0.095y = -38 \end{array}$$

(6)

b. Graph the system of inequalities. Be sure to identify the corner points.



$$\begin{array}{r} -0.095y = -38 \\ \hline y = 40 \\ x = 40 \end{array}$$

8. High concentrations of carbon monoxide can cause coma. The time required for a person to reach the concentration level capable of causing coma can be described by

$t(x) = 0.0002x^2 - 0.316x + 127.9$  where  $t$  is exposure time in hours and  $500 < x < 800$  is the concentration level in parts per million.

a. What is the exposure time capable of causing coma if the carbon monoxide level is 630 parts per million? Round answer to three decimal places.

$x = 630$

(6)

$t = 0.0002(630)^2 - 0.316(630) + 127.9 = 8.200 \text{ hours}$

b. What concentration level would be capable of causing coma in 8 hours? Round answer to three decimal places.

(6)

$t = 8$

$8 = 0.0002x^2 - 0.316x + 127.9$

$0 = 0.0002x^2 - 0.316x + 119.9$

$$x = \frac{-(-0.316) \pm \sqrt{(-0.316)^2 - 4(0.0002)(119.9)}}{2(0.0002)}$$

$x = 946.844, 633.156$