1. Use the function below to answer questions 1(a), 1(b), and 1(c). Keep your numeric values exact.

$$f(x) = \frac{\sqrt{x}-9}{x^2-8}$$

(a) [5 pts] Determine the **$x$-intercept(s)** of $f(x)$.

$0 = \dfrac{\sqrt{x}-9}{x^2-8} \longrightarrow 0 = \sqrt{x}-9 \rightarrow 9 = \sqrt{x}$

$81 = x$

$\boxed{\text{X-INT @ } (81, 0)}$

(b) [5 pts] Determine the **domain** of $f(x)$. Give your answer in interval notaton.

EVEN RADICAL: $x \geq 0$

DENOMINATOR: $x^2 - 8 = 0$

$x^2 = \pm\sqrt{8}$

$-\sqrt{8}$ $\quad 0 \quad$ $+\sqrt{8}$

$\boxed{\text{DOMAIN: } [0, \sqrt{8}) \cup (\sqrt{8}, \infty)}$

(c) [5 pts] The function $g(x)$ is created by moving $f(x)$ one unit to the left. Determine the formula for $g(x)$. You do not have to simplify your function.

$$\boxed{g(x) = \frac{\sqrt{x+1}-9}{(x+1)^2-8}}$$



Points earned: ____
out of a possible 15 points

2. Use the function below to answer questions 2(a), 2(b), and 2(c). Keep your numeric values exact.

$$f(x) = 5x^2 - 4x - 8$$

(a) [5 pts] Determine the $x$-**intercept**(s) of $f(x)$.

$$0 = 5x^2 - 4x - 8$$

$$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(5)(-8)}}{2(5)} = \frac{4 \pm \sqrt{176}}{10}$$

$$\boxed{\text{X-INTS: } \left(\frac{4+\sqrt{176}}{10}, 0\right) \left(\frac{4-\sqrt{176}}{10}, 0\right)}$$

(b) [5 pts] Determine the $y$-**intercept**(s) of $f(x)$.

$$f(0) = 5(0)^2 - 4(0) - 8$$
$$= -8$$

$$\boxed{\text{Y-INT } (0, -8)}$$

(c) [5 pts] Determine the **range** of $f(x)$. Give your answer in interval notaton.

VERTEX:

$$h = \frac{-(-4)}{2(5)} = \frac{4}{10} = \frac{2}{5} \qquad k = 5\left(\frac{2}{5}\right)^2 - 4\left(\frac{2}{5}\right) - 8 = \frac{-44}{5}$$

QUADRATIC IS RIGHTSIDE-UP, SO RANGE IS $\boxed{\left[\frac{-44}{5}, \infty\right)}$

3. A point $P$ has coordinates $(-4, 5)$. Answer the following.

(a) [5 pts] Let point $Q$ be at the origin. Determine the length of the line segment $PQ$.

$$\text{LENGTH} = \sqrt{(-4-0)^2 + (5-0)^2}$$

$$= \sqrt{16+25} = \boxed{\sqrt{41}}$$

(b) [5 pts] Determine an equation for the line **perpendicular** to $5x + 3y = 7$ that contains the point $P$.

$$5x+3y=7$$

$$3y=-5x+7$$

$$y=-\frac{5}{3}x+\frac{7}{3}$$

$$\boxed{y=\frac{3}{5}(x+4)+5 \quad \text{OR} \quad y=\frac{3}{5}x-\frac{37}{5}}$$

(c) [5 pts] Determine an equation for the **vertical line** containing the point $P$.

$$\boxed{x=-4}$$



Points earned: _____
out of a possible 15 points

4. Let $f(x) = x + 2$ and $g(x) = 19 - x^2$. Answer the following:

(a) [5 pts] Compute $(f - g)(x)$. Simplify your answer completely.

$$(f-g)(x) = (x+2)-(19-x^2)$$
$$= x+2-19+x^2 = \boxed{x^2+x-17}$$

(b) [5 pts] Compute $(f \circ g)(x)$. Simplify your answer completely.

$$(f\circ g)(x) = f(g(x))$$
$$= (19-x^2)+2$$
$$= \boxed{-x^2+21}$$

(c) [5 pts] Compute $(g \circ f)(x)$. Simplify your answer completely.

$$(g\circ f)(x) = 19-(x+2)^2$$
$$= 19-(x+2)(x+2)$$
$$= 19-(x^2+4x+4)$$
$$= \boxed{-x^2-4x+15}$$



Points earned: _____
out of a possible 15 points

5. A business has a monthly fixed cost of \$4500, which includes rent, utilities, and labor. They have a variable cost of \$1.37 per item that they produce. Define $x$ as the number of items that they produce on a monthly basis. Use this information to answer the following:

_______ (a) [5 pts] Denote $C$ as their total **monthly cost** (measured in dollars) of operations. Determine the formula for $C(x)$.

$$C(x) = 4500 + 1.37x$$

_______ (b) [10 pts] The company will break even when they sell exactly 2500 items. Determine what price they will need to set in order to make this happen.

$$C(2500) = 4500 + 1.37(2500)$$

$$= 7925$$

So REVENUE $= p \cdot (2500) = 7925$

$$p = \frac{7925}{2500} = \boxed{\$3.17}$$



Points earned: _______
out of a possible 15 points

6. Answer each of the questions below, and the function referred to is defined by

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

(a) [3 pts] Determine the value for $f(-2)$.

$$f(-2) = -5(-2)+2 = 10+2 = \boxed{12}$$

(b) [3 pts] Determine the value for $f(3)$.

$$f(3) = (3+3)^2 - 1 = 6^2 - 1 = \boxed{35}$$

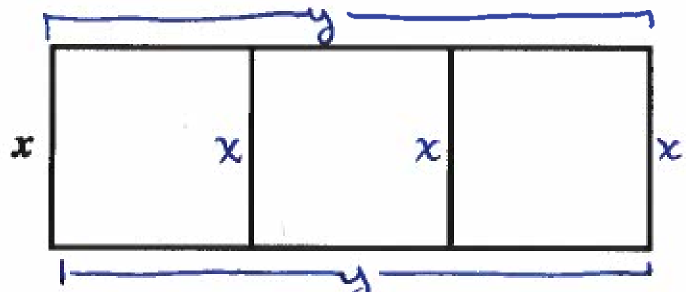
(c) [4 pts] Determine the average rate of change of the function from $x = -2$ to $x = 3$.

$$ARC = \frac{35-12}{3-(-2)} = \boxed{\frac{23}{5}}$$



Points earned: ______
out of a possible 10 points

7. A rectangular field will be fenced on all four sides. There will also be two lines of fence across the field, parallel to the shorter side, which has length $x$ ft. (See diagram below.). Answer the following.



(a) [6 pts] If 2400 ft of fencing are available to create the field, determine a function $A(x)$ that models the area of the rectangular field.

$2400 = 4x + 2y$

$1200 = 2x + y$

$1200 - 2x = y$

$A = xy$

$A = x(1200 - 2x)$

$\boxed{A(x) = -2x^2 + 1200x}$

(b) [9 pts] Determine the dimensions of the field will produce the maximum area.

$x = h = \frac{-1200}{2(-2)} = \frac{-1200}{4} = \boxed{300 \text{ ft}}$

$y = 1200 - 2(300) = 1200 - 600 = \boxed{600 \text{ ft}}$

Extra space for work. **Do not detach this page.** If you want us to consider the work on this page you should print your name, instructor and class meeting time below.

Name (print): ________________ Instructor (print): ________________ Time: ________________



Points earned: ______
out of a possible 0 points