Math 120 **Quiz #5A** Name: _____
Fall 2009 **D. Arnold**

Instructions. (20 points) For multiple choice questions, circle the letter corresponding to your answer. For other questions, show all your work in the space provided. All answers must be exact unless otherwise indicated.

(5pts) **1.** Solve the following inequality. Sketch your answer on a number line, then use interval and set-builder notation to describe your solution.

$$\left| x - \frac{x-2}{13} \right| < 11$$

Solution: Rewrite the given inequality as a compound inequality.

$$-11 < x - \frac{x-2}{13} < 11$$

Multiply all three parts of the inequality by the common denominator.

$$13[-11] < 13\left[x - \frac{x-2}{13}\right] < [11]13$$

Distribute.

$$-143 < 13x - 13\left[\frac{x-2}{13}\right] < 143$$

Cancel.

$$-143 < 13x - (x-2) < 143$$

Note the critical use of parentheses after the minus sign. Distribute the minus sign and combine like terms.

$$-143 < 13x - x + 2 < 143$$
$$-143 < 12x + 2 < 143$$

Subtract 2 from all three parts of the last inequality.

$$-143 - 2 < 12x + 2 - 2 < 143 - 2$$
$$-145 < 12x < 141$$

Divide all three parts of the last inequality by 12.

$$\frac{-145}{12} < \frac{12x}{12} < \frac{141}{12}$$
$$-\frac{145}{12} < x < \frac{47}{4}$$

Hence, in interval notation, the solution is

$$\left(-\frac{145}{12}, \frac{47}{4}\right).$$

(5pts) **2.** Solve the following inequality. Sketch your answer on a number line, then use interval and set-builder notation to describe your solution.

$$|3x - 9| \geq 5$$

Solution:

$$\begin{array}{rcccc} & |3x-9| \geq 5 & & & \\ \Longrightarrow & 3x-9 \geq 5 & \text{or} & 3x-9 \leq -5 \\ \Longrightarrow & x \geq \frac{14}{3} & \text{or} & x \leq \frac{4}{3} \end{array}$$

In interval notation, the solution is $(-\infty, \frac{4}{3}] \cup [\frac{14}{3}, \infty)$.

(5pts) **3.** Consider the piecewise defined function

$$f(x) = \begin{cases} 1, & \text{if } x < -3, \\ 3, & \text{if } -3 \le x < 3, \\ 5, & \text{if } x \ge 3. \end{cases}$$

Evaluate: $f(-4) =$

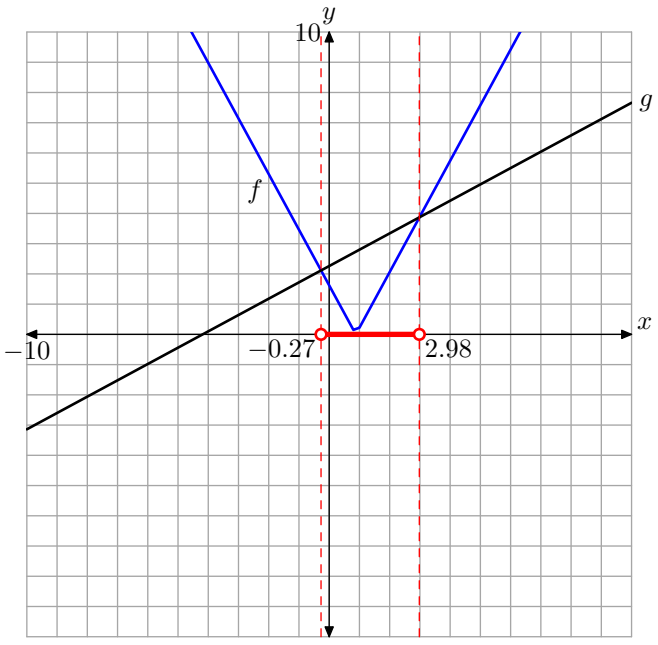
Solution: Because $-4 < -3$, we must use the first piece of the function. Hence $f(-4) = 1$.

(5pts) **4.** Use a graphing calculator to solve the inequality

$$|1.84x - 1.62| < 0.54x + 2.26$$

In the space provided below, duplicate the result on your viewing screen, shade and label your solution on the x-axis in the usual manner, then describe your solution using interval and set-builder notation.

Solution: Plot the graphs of the $f(x) = |1.84x - 1.62|$ and $g(x) = 0.54x + 2.26$ on your calculator, placing them in in Y1 and Y2 respectively, then use the `intersect` utility on the `CAlC` menu to determine the points of intersection of the two functions. To solve the inequality $|1.84x - 1.62| < 0.54x + 2.26$, we shade those values on the x-axis for which the graph of $f(x) = |1.84x - 1.62|$ is below the graph of $g(x) = 0.54x + 2.26$.



Hence, in interval notation, the solution is

$$(-0.27, 2.98).$$