MATH 111–15 (Kunkle), Quiz 2 Name: _____
10 pts, 10 minutes Jan 24, 2017

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1 (10 pts). Find the solution set to the given inequality. Write your answer in interval notation.

a. $\dfrac{x+3}{x-1} \geq 2.$ b. $|2-4x| \geq 7.$

1a. (Source: 1.1.52) Don't cross multiply. We can't determine whether multiplication by $(x-1)$ would change the direction of the inequality since $(x-1)$ could be positive or negative, depending on the value of x. Instead, use this basic technique for solving nonlinear equations and inequalities:

Get a zero on one side and factor the other.

$$0 \geq 2 - \frac{x-3}{x-1} = \left(\frac{2}{1}\right)\left(\frac{x-1}{x-1}\right) - \left(\frac{x+3}{x+1}\right)$$
$$= \frac{2(x-1)-(x+3)}{x-1} = \frac{x-5}{x-1}$$

Now make a sign chart.

$$\begin{array}{rl} x-5: & ---------0+++++++++ \\ x-1: & ----------0++++++++++++ \\ \dfrac{x-5}{x-1}: & +++++++++\text{DNE}----------0+++++++++ \\ \hline x: & \qquad\qquad 1 \qquad\qquad\qquad 5 \end{array}$$

So, $0 \geq \dfrac{x-5}{x-1}$ on the interval $(1, 5]$. **(done)**

1b. (Source: 1.2.more.2c) Remember that the absolute value of a number is its distance from 0 on the number line. So, $|2-4x| \geq 7$ says that $2-4x$ is a number at least than 7 units from 0, and therefore

$$\begin{array}{rcrcl} 2-4x &\leq& -7 & \text{or} & 2-4x \geq 7 \\ -4x &\leq& -9 & \text{or} & -4x \geq 5 \\ x &\geq& 9/4 & \text{or} & x \leq -5/4 \end{array}$$

That makes the solution set $(-\infty. - 5/4] \cup [9/4, \infty)$. **(done)**

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