Mathematics 1375/OL79, Fall 2020 **Quiz #1**
Instructor: Suman Ganguli **Due: Friday, Sept 18** **Name:** ______________________

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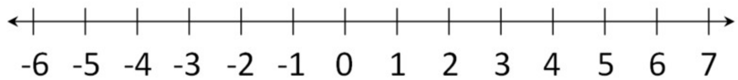
1. (4 points) For each of the following inequalities:

   - express the set in interval notation
   - graph the set on the number line

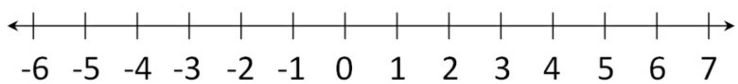
   (a) $-4 \le x < 1$



Solution:

$[-4, 1)$

   (b) $x \ge 0$ but $x \ne 3$



Solution:

$[0, 3) \cup (3, \infty)$

2. (6 points) Solve each inequality algebraically (show all your work!), and write the solution set in interval notation:

   (a)

$$|2x - 5| < 7$$

Solution: $|2x - 5| < 7$ if and only if

$$-7 < 2x - 5 < 7$$

$$-2 < 2x < 12$$

$$-1 < x < 6$$

So the solution set is $(-1, 6)$

   (b)

$$|15 - 3x| \ge 6$$

Solution: $|15 - 3x| \ge 6$ if and only if

$$15 - 3x \ge 6 \quad \text{or} \quad 15 - 3x \le -6$$

$$-3x \ge -9 \quad \text{or} \quad -3x \le -21$$

$$x \ge 3 \quad \text{or} \quad x \le 7$$

So the solution set is $(-\infty, 3] \cup [7, \infty)$

3. (Extra credit) Explain why the inequality $|7x+2| < -1$ has no solutions (i.e., the solution set is the "empty set": $\{\} = \emptyset$). Your explanation should consist of 1-2 complete sentences. (Hint: Explain in terms of the range, i.e., the set of outputs, of the absolute value function.)

Solution: The given inequality has no solutions because the left-hand side of the inequality is a negative number. Since the range of the $f(x) = |x|$ is $[0, \infty)$, i..e., the output of the absolute value function is always a number greater than or equal to 0, $|7x + 2|$ is certainly greater than or equal to 0 for all inputs x (in fact, $|7x + 2| \geq 2$ for all x!)