To solve Absolute Value Equations and Inequalities

1. Get the absolute value expression by itself, so you have an equation of the form
   \[ | \Delta | = \text{value} \]

2. Check your equation for special cases - no solution or \( \mathbb{R} \)
   (see example 1 and 2 below)

3. If the problem is not a special case, write and solve two equations:
   \[ \Delta = \text{positive value} \quad \text{and} \quad \Delta = \text{negative value} \]

4. Draw a number line and place open or closed circles at the two solutions to step two

5. If the equation involves:
   - the two points represent your solution
   - shade out from the two points to represent your solution
   - shade in from the two points to represent your solution

6. Use your number line to help you write the solution in set notation or interval notation as requested

A. Examples:

1. \[ |2x + 1| > -6 \]
   Infinite Solutions (all real numbers)
   Since the absolute value of any number is positive (which is greater than zero, therefore greater than -6)

2. \[ |2x + 1| < 0 \]
   No solution
   Since the absolute value of every number is positive which is never less than zero

3. \[ |3x + 1| - 4 = 10 \]
   \[ |3x + 1| = 14 \]
   \[ 3x + 1 = 14 \quad \text{or} \quad 3x + 1 = -14 \]
   \[ 3x = 13 \quad \text{or} \quad 3x = -15 \]
   \[ x = 13/3 \quad \text{or} \quad x = -5 \]

   Shade between the circles.
   Your solution can be written as:
   Interval notation: \((-5, 13/3)\)
   or Set builder Notation: \(\{ x | -5 < x < 13/3 \}\)

4. \[ |3x + 1| - 4 < 10 \]
   Shade between the circles.
   Your solution can be written as:
   Interval notation: \((-5, 13/3)\)
   or Set builder Notation: \(\{ x | -5 < x < 13/3 \}\)

5. \[ |3x + 1| - 4 \geq 10 \]
   Shade outside the circles.
   Your solution can be written as:
   Interval Notation: \((-\infty, -5] \cup [13/3, \infty)\)
   or Set Builder Notation: \(\{ x | x \leq -5 \text{ or } x \geq 13/3 \}\)
B. Equations:
1. $|x| = 9$
2. $|3x - 1| = 20$
3. $|4 - 2x| + 3 = 9$
4. $7|2x - 5| - 13 = 1$
5. $17 - |3x + 5| = 50$
6. $17 - |3x + 5| = 5$

C. Inequalities:
7. $|w| \geq 3$
8. $|2x| + 17 < 15$
9. $2 + |x - 2| > 20$
10. $6 - |3x - 2| \leq -7$

You Try:
1. $3|x| = 12$
2. $|3y| - 2 > 1$
3. $5|x-4| + 2 < 32$
4. $6 - |3x + 1| > 10$

HW: Page 569 Problems 9 - 21 odd, 47-69 odd, 75, 86-88 all (022)