

Math 095–Handout on Absolute Value–page #1

1. To solve absolute value problems:

- a. isolate the absolute value on one side of the problem
- b. set up two problems for the positive/negative directions on the number line

$$|ax+b| = c \text{ becomes } + (ax + b) = c \quad \text{or} \quad -(ax + b) = c$$

$$|ax+b| > c \text{ becomes } + (ax + b) > c \quad \text{or} \quad -(ax + b) > c$$

$$|ax+b| \geq c \text{ becomes } + (ax + b) \geq c \quad \text{or} \quad -(ax + b) \geq c$$

$$|ax+b| < c \text{ becomes } + (ax + b) < c \quad \text{and} \quad -(ax + b) < c$$

$$|ax+b| \leq c \text{ becomes } + (ax + b) \leq c \quad \text{and} \quad -(ax + b) \leq c$$

- c. solve and graph remember: every absolute value problem is written as two problems on absolute value problems,
 - = uses word “or”
 - > , ≥ uses word “or”
 - < , ≤ uses word “and”
 when you divide by a negative, the inequality reverses
 “or” is union, combine
 “and” is intersect, what’s in common

d. state interval notation for final solution

2. $|2x+9| - 7 \geq 22$ add 7 to isolate the absolute value

$|2x+9| \geq 29$ now write as two problems (≥ symbol uses word “or”)

+ (2x + 9) ≥ 29 or -(2x + 9) ≥ 29

2x + 9 ≥ 29 or -2x - 9 ≥ 29

2x ≥ 20 or -2x ≥ 38

x ≥ 10 or x ≤ -19

$(-\infty, -19] \text{ or } [10, \infty)$

3. $|3x-12| + 6 < 33$ subtract 6 to isolate the absolute value

$|3x-12| < 27$ now write as two problems (< symbol uses word “and”)

+ (3x - 12) < 27 and -(3x - 12) < 27

3x - 12 < 27 and -3x + 12 < 27

3x < 39 and -3x < 15

x < 13 and x > -5

$(-5, 13)$

All these absolute value problems require you to set up two problems (to take care of the two directions on the number line)! These all require you to memorize what word goes between the two problems!

4. If the constant is negative, you don’t need to do any work at all. You need to think about the concept of absolute value and state the result.

Absolute Value = negative empty set $|x| = -10 \Rightarrow$ empty set

Absolute Value < , ≤ negative empty set $|x| < -2 \Rightarrow$ empty set

Absolute Value > , ≥ negative all reals $|x| > -14 \Rightarrow$ all reals