Math 95– 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

$\lvert ax+b \rvert = c$	becomes	+ (ax + b) = c	or	−(ax + b) = c
$\lvert ax+b \rvert > c$	becomes	+ (ax + b) > c	or	−(ax + b) > c
$\lvert ax+b \rvert \geq c$	becomes	+ (ax + b) ≥ c	or	−(ax + b) ≥ c
$\lvert ax+b \rvert < c$	becomes	+ (ax + b) < c	and	−(ax + b) < c
$\lvert ax+b \rvert \leq c$	becomes	+ (ax + b) ≤ c	and	−(ax + b) ≤ 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. $\lvert 2x+9 \rvert$ − 7 ≥ 22 add 7 to isolate the absolute value

   $\lvert 2x+9 \rvert$ ≥ 29now 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

   (−∞, −19] or [10, ∞)

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

   $\lvert 3x-12 \rvert$ < 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	$\lvert x \rvert$	= −10⇒	empty set
Absolute Value < , ≤ negative	empty set	$\lvert x \rvert$	< −2 ⇒	empty set
Absolute Value > , ≥ negative	all reals	$\lvert x \rvert$	> −14⇒	all reals