Math 418!

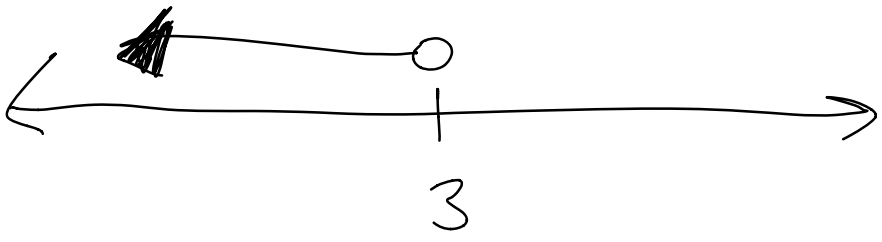
Inequalities $<, \leq, >, \geq$

$$2x \geq x^2$$

$$4+x < 3-x$$

$$2x < 6$$

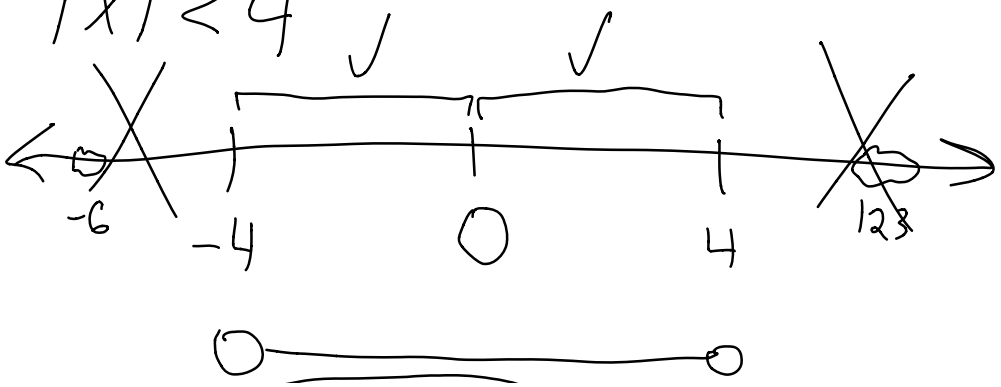
$$x < 3$$



$|x|$ = distance from x to 0

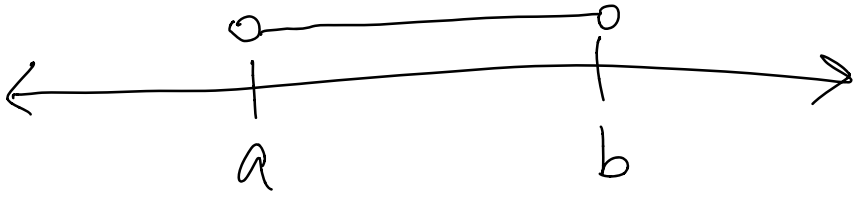
$= \sqrt{x^2}$

$|x| < 4$



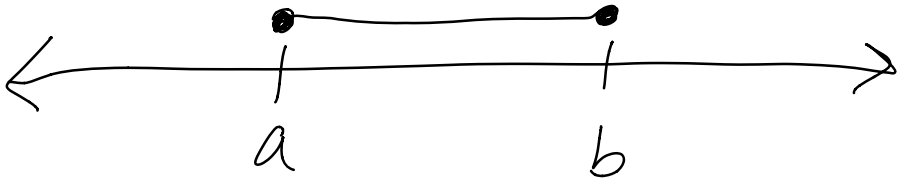
$[(-4,4)]$

Interval Notation: $a < b$



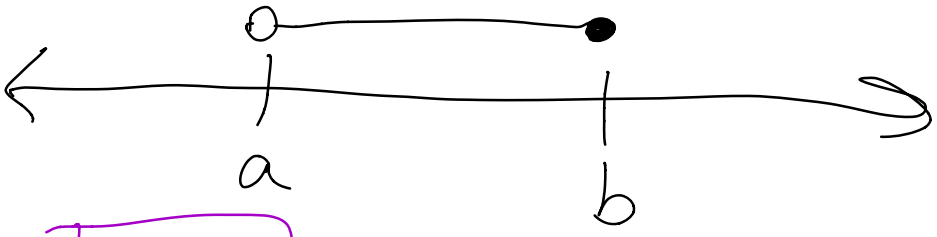
$(a,b) = \{x \mid a < x < b\}$

= all # between a and b



$[a,b] = \{x \mid a \leq x \leq b\}$

= all #'s between a and b, including a and b.



$(a,b] = \{x \mid a < x \leq b\}$

= all #'s between a and b including b (but NOT a)

$[a, b) = \{x \mid a \le x < b\}$

= All #'s between a and b including a (but NOT b)

One more thing...

$x < 2$ or $x > 10$

$\cup$ = union

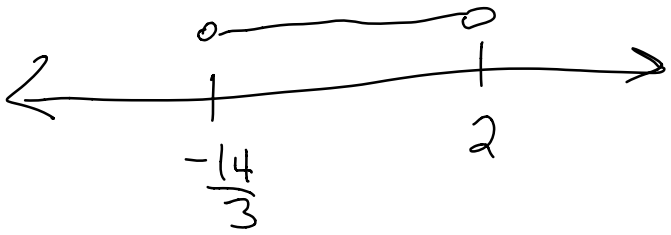
$(-\infty, 2) \cup (10, \infty)$

$|3x + 4| < 10$ | Two Rules

$$-10 < 3x+4 < 10$$

$$-14 < 3x < 6$$

$$\frac{-14}{3} < x < 2$$



$$\left(\frac{-14}{3}, 2\right)$$

① $|x| < \#$

$-\# < x < \#$

② $|x| > \#$

$x < -\#$ or $x > \#$

N.B.: Rule ① also works w/ $\leq$

Rule ② also works w/ $\geq$

$$10 < -5x < 20$$

$$-2 > x > -4$$

$$-4 < x < -2$$

$$(-4, -2)$$

$$|-3x-4| \geq 8$$

$-3x-4 \leq -8$ or $-3x-4 \geq 8$

$-3x \leq -4$ or $-3x \geq 12$

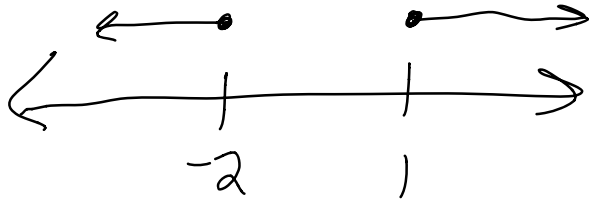
$x \geq \frac{4}{3}$ or $x \leq -4$

$\frac{4}{3} \leq x$ or $x \leq -4$

$\left[\frac{4}{3}, \infty\right) \cup (-\infty, -4]$

$(-\infty, -4] \cup \left[\frac{4}{3}, \infty\right)$

Don't Do:



$[1, -2]$

↑ No #'s.

Do these Problems

(1) Solve $|x| > 7$

② Solve $|2x+1| = 5$

③ Solve $|4x-6| < 2$

Absolute Value Redux:

$$|x| = \begin{cases} -x & \text{if } x < 0 \text{ ?? } \checkmark \\ x & \text{if } x \geq 0 \text{ ? } \checkmark \end{cases}$$

Different Rules

For different Inputs

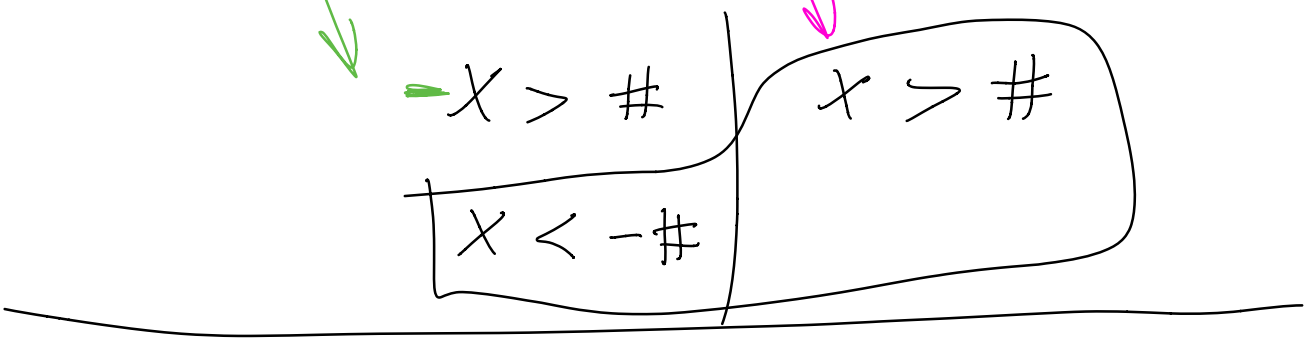
$|5| = 5$

$|-8| = -(-8) = 8$

Rule Two Redux

② $|x| > \#$ $\longrightarrow$ $x < -\#$ or $x > \#$

$$|x| = \begin{cases} -x & \text{if } x < 0 \\ x & \text{if } x \geq 0 \end{cases}$$



Solve $|-2x+1| - 8 \geq 2$

$$|-2x+1| \geq 10$$

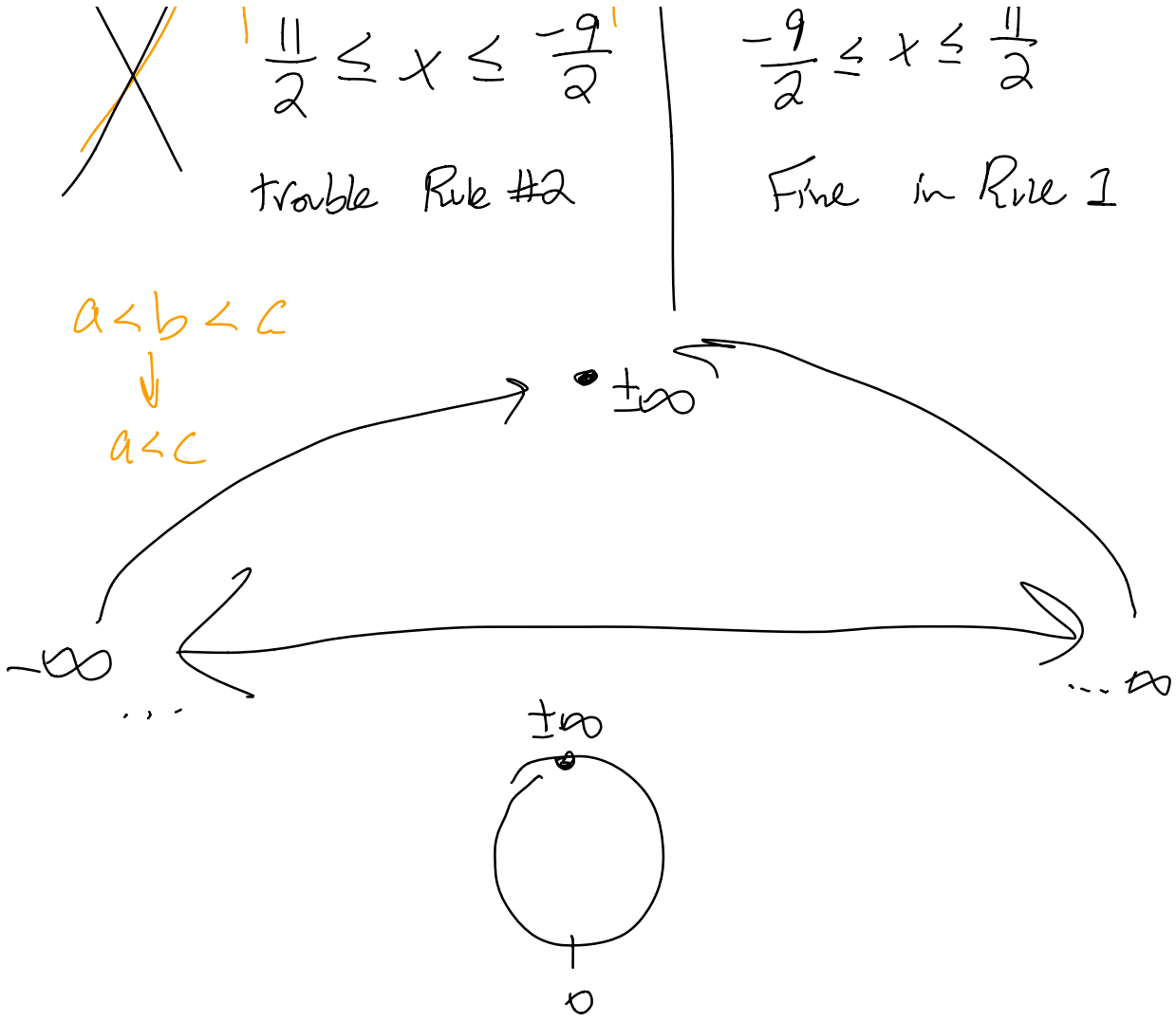
$$-2x+1 \leq -10 \quad \text{or} \quad -2x+1 \geq 10$$

$$-2x \leq -11 \quad \text{or} \quad -2x \geq 9$$

$$x \geq \frac{11}{2} \quad \text{or} \quad x \leq \frac{-9}{2}$$

$$\left[\frac{11}{2}, \infty\right) \cup \left(-\infty, \frac{-9}{2}\right]$$

$\frac{11}{2} \leq \frac{-9}{2}$


$\frac{11}{2} \leq x \leq \frac{-9}{2}$
trouble Rule #2
$\frac{-9}{2} \leq x \leq \frac{11}{2}$
Fine in Rule 1
$a < b < c$
$a < c$
$\pm\infty$
$-\infty$
∞
$\pm\infty$
0