Absolute Value Inequalities

2-7

These turn into AND or OR compound inequalities:

$|x| > 3$

$x > 3$ $\quad x < -3$

Think about solution sets

$x > 3$ OR $x < -3$

graph and write solution set

$|x-4| < 3$

$x-4 < 3$

$+4 \quad +4$

$x < 7$

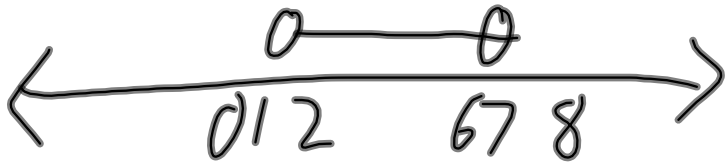
$x-4 > -3$

$+4 \quad +4$

$x > 1$

solve and graph

$1 < x < 7$



Rules for absolute value inequalities

① Get absolute value by itself

$9 < |x-2| + 1$

$-1 \quad -1$

$8 < |x-2|$

$8 < x-2$ or $-8 > x-2$

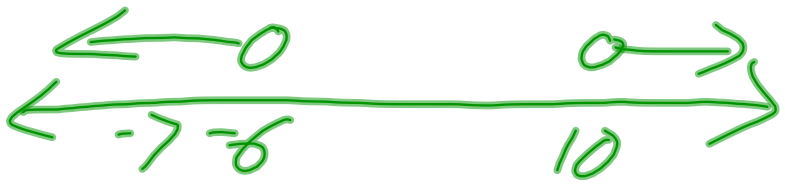
$+2 \quad +2 \quad +2 \quad +2$

$10 < x$ or $-6 > x$

$x > 10$

$10 < x$

$-6 > x$



② Make sure absolute value is on left side

$8 < |x-2|$ switch

$|x-2| > 8$

③@ If |absolute value| is > or ≥
write an OR compound

$|x-2|>8$

$x-2>8$ or $x-2<-8$

switch sign and take opposite #

solve and graph

If |absolute value| is $<$ or $\leq$ write an AND compound inequality

① $|3x+6| \geq 12$

② $|2x-3| > 7$

③ $3|2x+6|-9 < 15$

④ $|5z+3|-7 < 34$

solve, graph and check

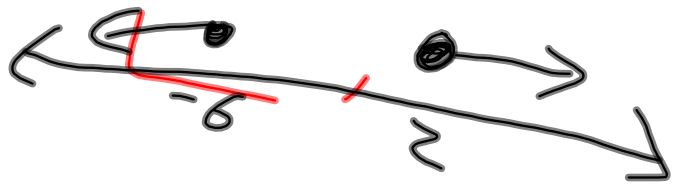
① $|3x+6| \geq 12$

$3x+6 \geq 12$

$-6 \quad -6$

$\frac{3x}{3} \geq \frac{6}{3}$

$x \geq 2$



check

$|3(-7)+6| \geq 12$ $|-15| \geq 12$ $15 \geq 12$ ✓

$|3(3)+6| \geq 12$

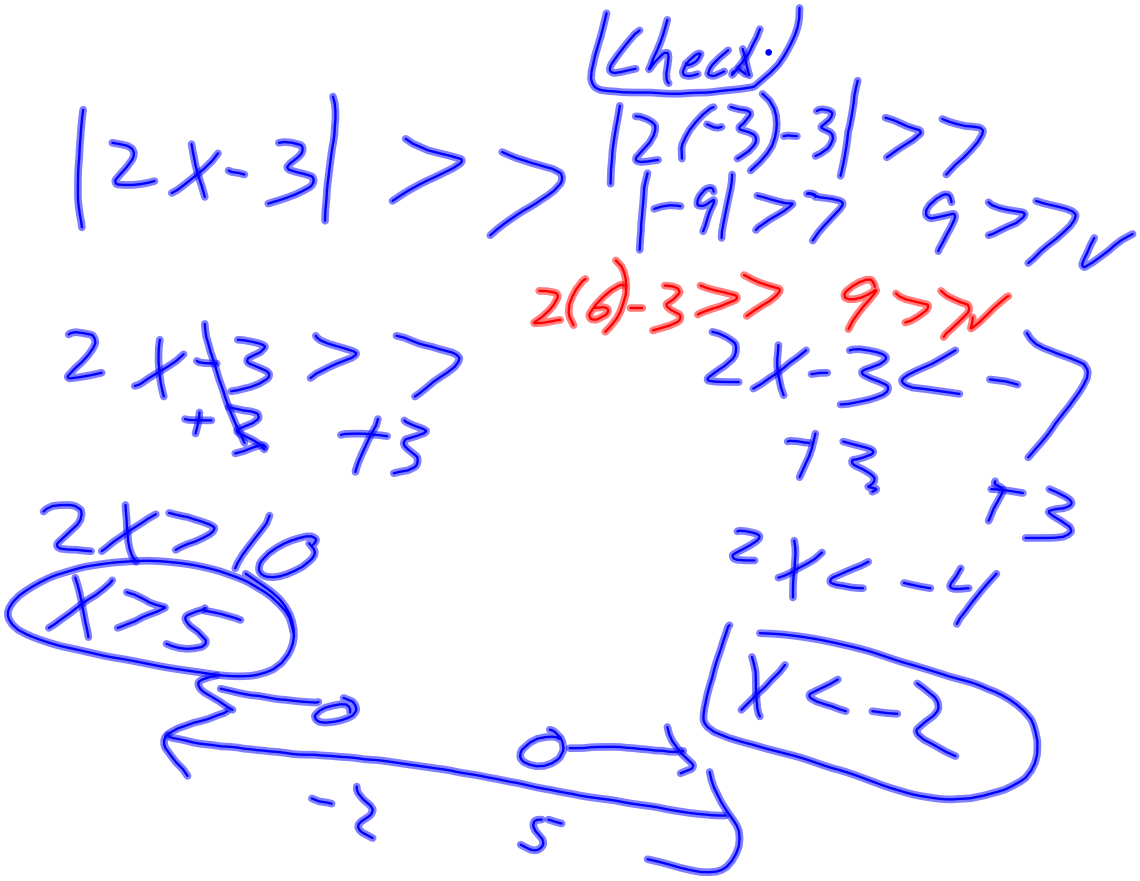
$15 \geq 12$

$3x+6 \leq -12$

$-6 \quad -6$

$\frac{3x}{3} \leq \frac{-18}{3}$

$x \leq -6$


|2x-3| >> 7
Check:
|2(-3)-3| >> 7
|-9| >> 7
9 >> 7 ✓
2(6)-3 >> 7
9 >> 7 ✓
2x-3 >> 7
+3 +3
2x >> 10
x > 5
2x-3 << -7
+3 +3
2x << -4
x < -2
-2
5

③ $3|2x+6|-9<15$ $\quad 9<15$

$+9 \quad +9$

$\frac{3|2x+6|}{3}<\frac{24}{3}$

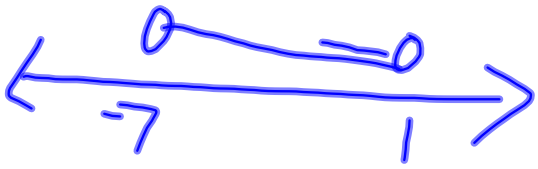
$|2x+6|<8$

$2x+6<8$

$-6 \quad -6$

$2x<2$

$x<1$



$2x+6>-8$

$-6 \quad -6$

$2x>-14$

$x>-7$ $\quad -7<x<1$

④ $|5x+3|-7<34$

$+7 \quad +7$

$|5x+3|<41$

$5x+3<41$ $\quad$ $5x+3>-41$

$-3 \quad -3 \quad -3 \quad -3$

$5x<38 \quad 5x>-44$

$\frac{5x}{5}<\frac{38}{5} \quad \frac{5x}{5}>\frac{-44}{5}$

$x<7\frac{3}{5} \quad x>-44$

$x>-8\frac{4}{5}$

$-8 \quad 7\frac{3}{5}$

$$\left|3x+\frac{5}{8}\right| < -4$$

$\emptyset$ or $\{\ \}$

$|2x+9|+5>3$

Isolate absolute value first

$|2x+9|>-2$

Absolute value is always positive so solution is all real #s.

$(-\infty,\infty)$ $\{x/x \text{ is a real \#}\}$