oga §2.6 #s 1-63

#s1-63 Solve the absolute value inequality. Special Instructions: Set-builder & Interval Notation for all answers. Graphs only to figure out the situation.

① $|x| < 3$

$\{x \mid x < 3 \text{ and } x > -3\}$


$x \in (-3, 3)$

AND

③ $|x| \geq 2$

$\{x \mid x \geq 2 \text{ OR } x \leq -2\}$

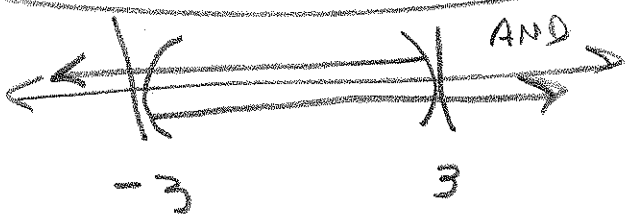
$= (-\infty, -2] \cup [2, \infty)$


⑤ $|x| + 2 < 5$

$|x| < 3$

$\{x \mid x < 3 \text{ and } x > -3\}$

$(-3, 3)$

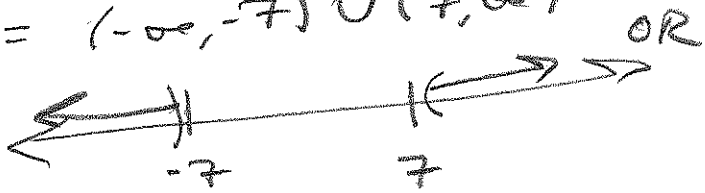



⑦ $|t| - 3 > 4$

$|t| > 7$

$\{t \mid t > 7 \text{ or } t < -7\}$

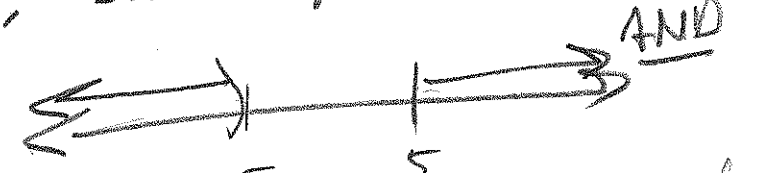
$= (-\infty, -7) \cup (7, \infty)$




⑨ $|y| < -5$ Nevah! But if you forget...

$\{y \mid y < -5 \text{ and } y > 5\}$

$= \emptyset$




No overlap - AND needs overlap.

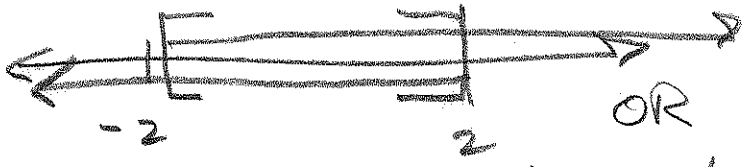
099 §2.6 #11-63

(11) $|x| \geq -2$ ALWAYS! $\mathbb{R} = (-\infty, \infty)$

$\{x \mid x \geq -2$ OR $x \leq 2\}$ If you forget, solid skills will remind you

$= (-\infty, \infty)$

$= \mathbb{R}$



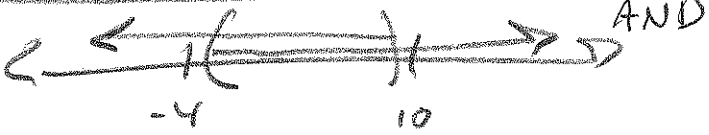

"OR" means one, the other or both
our solution is "all reals."

(13) $|x-7| < 7$

$x-7 < 7$ and $x-7 > -7$

$\{x \mid x < 10$ and $x > -4\}$

$= (-4, 10)$

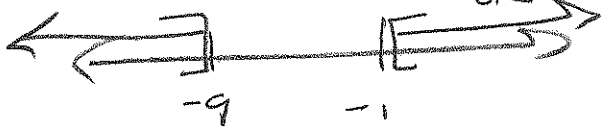



(15) $|a+5| \geq 4$

$a+5 \geq 4$ OR $a+5 \leq -4$

$\{a \mid a \geq -1$ OR $a \leq -9\}$

$= (-\infty, -9] \cup [-1, \infty)$




(17) $|a-1| < -3$

$\emptyset$

(19) $|2x-4| < 6$

$2x-4 < 6$ and $2x-4 > -6$

$2x < 10$ and $2x > -2$

$\{x \mid x < 5$ and $x > -1\}$


$(-1, 5)$

099 §2.6 #s 21-63

(21) $|3y+9| \geq 6$

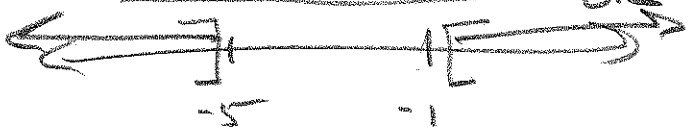
$3y+9 \geq 6$ OR $3y+9 \leq -6$

$3y \geq -3$ OR $3y \leq -15$

$y \geq -\frac{3}{3}$ OR $y \leq -\frac{15}{3}$

$\{y \mid y \geq -1 \text{ OR } y \leq -5\}$

$(-\infty, -5] \cup [-1, \infty)$




(23) $|2k+3| \geq 7$

$2k+3 \geq 7$ OR $2k+3 \leq -7$

$2k \geq 4$ OR $2k \leq -10$

$\{k \mid k \geq 2 \text{ OR } k \leq -5\}$

$= (-\infty, -5] \cup [2, \infty)$

You use # line graph if it helps you "see"

(25) $|x-3| + 2 < 6$

$|x-3| < 4$

$x-3 < 4$ and $x-3 > -4$

$\{x \mid x < 7 \text{ and } x > -1\}$

$= (-1, 7)$

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(27) $|2a+1|+4 \geq 7$

$|2a+1| \geq 3$

$2a+1 \geq 3$ OR $2a+1 \leq -3$

$2a \geq 2$ OR $2a \leq -4$

$\{a \mid a \geq 1$ OR $a \leq -2\}$

$= (-\infty, -2] \cup [1, \infty)$

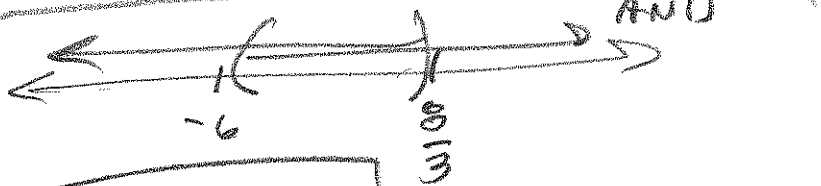
(29) $|3x+5|-8 < 5$

$|3x+5| < 13$

$3x+5 < 13$ and $3x+5 > -13$

$3x < 8$ and $3x > -18$

$\{x \mid x < \frac{8}{3}$ and $x > -6\}$




$(-6, \frac{8}{3})$

099 S2.6 #s 31-63

(31) $|x-3| \leq 5$

$x-3 \leq 5$ and $x-3 \geq -5$

$\{x \mid x \leq 8 \text{ and } x \geq -2\}$

$= [-2, 8]$

(33) $|3y+1| < 5$

$3y+1 < 5$ and $3y+1 > -5$

$3y < 4$ and $3y > -6$

$\{y \mid y < \frac{4}{3} \text{ and } y > -2\}$

$= (-2, \frac{4}{3})$

(35) $|a+4| \geq 1$

$a+4 \geq 1$ OR $a+4 \leq -1$

$\{a \mid a \geq -3 \text{ OR } a \leq -5\}$

$= (-\infty, -5] \cup [-3, \infty)$

$a \leq -5$ OR $a \geq -3$

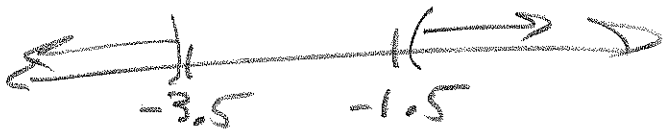
(37) $|2x+5| > 2$

$2x+5 > 2$ OR $2x+5 < -2$

$2x > -3$ OR $2x < -7$

$\{x \mid x > -\frac{3}{2} \text{ OR } x < -\frac{7}{2}\}$

$= (-\infty, -\frac{7}{2}) \cup (-\frac{3}{2}, \infty)$



099 §2.6 #s 39–63

(39) $|-5x+3| \le 8$ is same as $|5x-3| \le 8$

$-5x+3 \le 8$ and $-5x+3 \ge -8$

$-5x \le 5$ and $-5x \ge -11$

$\frac{-5x}{-5} \ge \frac{5}{-5}$ and $\frac{-5x}{-5} \le \frac{-11}{-5}$

Don't combine these into one step - You may skip this step as long as I see the one before & the one after & it's all "legal."

$\{x \mid x \ge -1 \text{ and } x \le \frac{11}{5}\}$

$= [-1, \frac{11}{5}]$

(41) $|-3x+7| < 2$

$-3x+7 < 2$ and $-3x+7 > -2$

$-3x < -5$ and $-3x > -9$

Inequality reverses!

$\{x \mid x > \frac{5}{3} \text{ and } x < 3\}$

$= (\frac{5}{3}, 3)$


(43) $|5-x| > 3$

$5-x > 3$ OR $5-x < -3$

$-x > -2$ OR $-x < -8$

$\{x \mid x < 2 \text{ OR } x > 8\}$

$= (-\infty, 2) \cup (8, \infty)$

099 S' 2.6 #3 45-63

(45) $|3-\frac{2}{3}x| \geq 5$ LCD = 3

$\left|\frac{3}{1}\cdot\frac{3}{3}-\frac{2x}{3}\right| \geq \frac{5}{1}\cdot\frac{3}{3}$

$\left|\frac{9-2x}{LCD}\right| \geq \frac{15}{LCD}$

$|9-2x| \geq 15$

$9-2x \geq 15$ OR $9-2x \leq -15$

$-2x \geq 6$ OR $-2x \leq -24$

$\{x \mid x \leq -3$ OR $x \geq 12\}$

$= (-\infty, -3] \cup [12, \infty)$

(47) $|2-\frac{1}{2}x| > 1$ LCD = 2

$\left|\frac{2}{1}\cdot\frac{2}{2}-\frac{x}{2}\right| > \frac{1}{1}\cdot\frac{2}{2}$

$\left|\frac{4-x}{2}\right| > \frac{2}{2}$

$|4-x| > 2$

$4-x > 2$ OR $4-x < -2$

$-x > -2$ OR $-x < -6$

$\{x \mid x < 2$ OR $x > 6\}$

$= (-\infty, 2) \cup (6, \infty)$

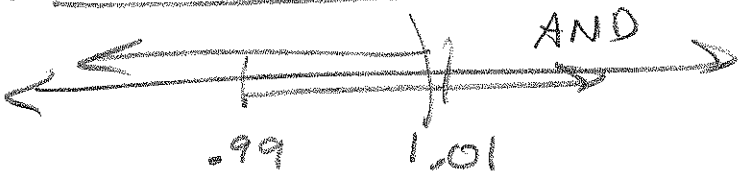
099 §2.6 #s 49-63

(49) $|x-1| < 0.01$

$x-1 < .01$ and $x-1 > -.01$

$\{x \mid x < 1.01 \text{ and } x > .99\}$

$= (.99, 1.01)$




(51) $|2x+1| \geq \frac{1}{5}$

~~$2x+1 \geq \frac{1}{5}$ or $2x+1 \leq -\frac{1}{5}$~~

$\left|\frac{2x}{1} \cdot \frac{5}{5} + \frac{1}{1} \cdot \frac{5}{5}\right| \geq \frac{1}{5}$

$\left|\frac{10x+5}{LCD}\right| \geq \frac{1}{LCD}$

$|10x+5| \geq 1$

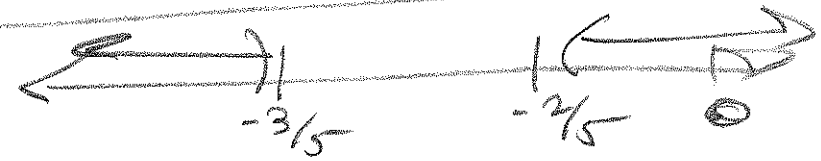
$10x+5 \geq 1$ or $10x+5 \leq -1$

$10x \geq -4$ or $10x \leq -6$

$x \geq -\frac{4}{10} = -\frac{2}{5}$ or $x \leq -\frac{6}{10} = -\frac{3}{5}$

$\{x \mid x \geq -\frac{2}{5} \text{ or } x \leq -\frac{3}{5}\}$

$= (-\infty, -\frac{3}{5}) \cup (-\frac{2}{5}, \infty)$



099 8.6 #s 53-63

(53) $|3x-2| \le \frac{1}{3}$

~~$3x-2 \le \frac{1}{3}$ and $3x-2$~~ Do nacs part

$\left|\frac{3x}{1}\cdot\frac{3}{3} - \frac{2}{1}\cdot\frac{3}{3}\right| \le \frac{1}{3}$

$\left|\frac{9x-6}{3}\right| \le \frac{1}{3}$

$|9x-6| \le 1$

$9x-6 \le 1$ and $9x-6 \ge -1$

$9x \le 7$ and $9x \ge 5$

$\left\{x \mid x \le \frac{7}{9} \text{ and } x \ge \frac{5}{9}\right\}$

$= \left[\frac{5}{9}, \frac{7}{9}\right]$

(55) $\left|\frac{3x+1}{2}\right| > \frac{1}{2}$

$|3x+1| > 1$

$3x+1 > 1$ OR $3x+1 < -1$

$3x > 0$ OR $3x < -2$

$\left\{x \mid x > 0^{*} \text{ OR } x < -\frac{2}{3}\right\}$

$= (-\infty, -2/3) \cup (0, \infty)$

* $\frac{0}{3} = 0$

099 §2.6 #s 61-63

(61) $\left|2x - \frac{1}{5}\right| < .3 = \frac{3}{10}$ Hmm .3 is $\frac{3}{10}$. cool

LCD = 10

$\left|\frac{2x}{1} \cdot \frac{10}{10} - \frac{1}{5} \cdot \frac{2}{2}\right| < \frac{3}{10}$

$\left|\frac{20x-2}{10}\right| < \frac{3}{10}$

$|20x-2| < 3$

$20x-2 < 3$ and $20x-2 > -3$

$20x < 5$ and $20x > -1$

$x < \frac{5}{20} = \frac{1}{4}$ and $x > -\frac{1}{20}$

$\left\{x \mid x < \frac{1}{4} \text{ and } x > -\frac{1}{20}\right\} = \left(-\frac{1}{20}, \frac{1}{4}\right)$

(63) Write the continued inequality $-4 \le x \le 4$ as a single absolute value inequality:

$|x| \le 4$ does it.