

Directions: Answer each question as completely as possible. Show all work for credit. Good luck!

1. Solve each inequality. Express your answers using **interval notation**.

a)  $|1 - 2x| \leq 3$

$$\begin{aligned} -3 &\leq 1 - 2x \leq 3 \\ -3 - 1 &\leq -2x \leq 3 - 1 \\ -4 &\leq -2x \leq 2 \end{aligned} \rightarrow 2 \geq x \geq -1$$

$[-1, 2]$

b)  $\frac{5}{x-3} \geq \frac{3}{x+1}$  Do not "cross multiply"

$$\frac{5}{x-3} - \frac{3}{x+1} \geq 0$$

LCD  $\frac{5(x+1) - 3(x-3)}{(x-3)(x+1)} \geq 0$

c)  $x(x-7) > 8$

$$x^2 - 7x - 8 > 0$$

$$(x-8)(x+1) > 0$$

chk intervals to

find  $(-\infty, -1) \cup (8, \infty)$  is soln.

d)  $\frac{x}{2} - \frac{8x}{3} + \frac{x}{4} > \frac{23}{6}$

LCD  $\rightarrow 12 \left( \frac{x}{2} - \frac{8x}{3} + \frac{x}{4} \right) > \left( \frac{23}{6} \right) 12$  to clear denom.

$$\begin{aligned} 6x - 32x + 3x &> 46 \\ -23x &> 46 \end{aligned}$$

$$x < -2$$

(notice it was quickly solved w/o setting  $> 0$ )

e)  $|3x - 4| > |x + 6|$

2 cases:

$$3x - 4 > x + 6$$

$$2x > 10$$

$$x > 5$$

chk.  $x = 0$  (always!)

$$|-4| \not> |6|$$

chk  $x = -1$

$$|-7| > |5| \text{ yes}$$

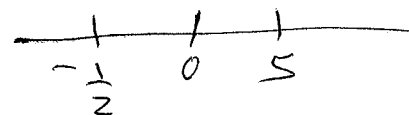
$$3x - 4 < -(x + 6)$$

$$3x + x < -6 + 4$$

$$4x < -2$$

$$x < -1/2$$

$$(-\infty, -1/2) \cup (5, \infty)$$



chk  $x = 6$

$$|-4| > |12| \text{ yes}$$

2. Solve for  $x$ .

a)  $|x^2 + 3x - 2| = 2$

$$x^2 + 3x - 2 = -2$$

$$x^2 + 3x = 0$$

$$x(x+3) = 0$$

$$x = 0, -3$$

Check: All work

b)  $|1 - 2x| = 3 + |x + 5|$

$$x^2 + 3x - 2 = 2$$

$$x^2 + 3x - 4 = 0$$

$$(x-1)(x+4) = 0$$

$$x = 1, -4$$

4 cases to consider, since the addition of a constant outside the abs value on one side (or both, if that were the case) gives 4 distinct equations.

①  $1 - 2x = 3 + (x + 5) \rightarrow -7 = 3x \rightarrow x = -7/3 \checkmark$

②  $1 - 2x = 3 + -(x + 5) \rightarrow 3 = x \quad X$

③  $-(1 - 2x) = 3 + (x + 5) \rightarrow -9 = -x \rightarrow x = 9 \checkmark$

④  $-(1 - 2x) = 3 + -(x + 5) \rightarrow 1 = -3x \rightarrow x = -1/3 \quad X$

only ① + ③ work.

~~$$\begin{aligned} & \log_3 \left( \frac{1+x}{1+x^2} \right) = \log_3 (1+x) - \log_3 (1+x^2) \\ & \log_3 (1+x) - \log_3 (1+x^2) = \log_3 \left( \frac{1+x}{1+x^2} \right) \end{aligned}$$~~

~~$$\log_3 \left( \frac{1+x}{1+x^2} \right) = \log_3 (1+x) - \log_3 (1+x^2)$$~~