

11-30-17 1st Trig

$$|x| = 5$$

What is x?

$$x = 5 \text{ or } -5$$

$$|x - 3| > 5$$

$$\begin{array}{r} x - 3 > 5 \\ +3 \quad +3 \\ \hline x > 8 \end{array}$$

OR

$$\begin{array}{r} -(x - 3) > 5 \\ -1 \quad -1 \\ \hline \end{array}$$

$$x - 3 < -5$$

$$\begin{array}{r} +3 \quad +3 \\ \hline \end{array}$$

$$x < -2$$

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



$$\textcircled{1} |x - 10| > 14$$

$$\begin{array}{r} x - 10 > 14 \\ +10 \quad +10 \\ \hline x > 24 \end{array}$$

OR

$$\begin{array}{r} -(x - 10) > 14 \\ -1 \quad -1 \\ \hline \end{array}$$

$$x - 10 < -14$$

$$\begin{array}{r} +10 \quad +10 \\ \hline \end{array}$$

$$x < -4$$

$$x > 24 \text{ OR } x < -4$$



$$\textcircled{2} \quad |2x-1| > 5$$

$$2x-1 > 5 \quad \text{OR} \quad \frac{-(2x-1) > 5}{-1 \quad -1}$$

$$\frac{+1 \quad +1}{2x > 6}$$

$$x > 3$$

$$2x-1 < -5$$

$$\frac{+1 \quad +1}{2x < -4}$$

$$x < -2$$

$$x > 3 \quad \text{OR} \quad x < -2$$



$$\textcircled{3} \quad |x-8| < 12$$

$$x-8 < 12 \quad \text{AND} \quad \frac{-(x-8) < 12}{-1 \quad -1}$$

$$\frac{+8 \quad +8}{x < 20}$$

$$x-8 > -12$$

$$\frac{+8 \quad +8}{x > -4}$$

$$x < 20 \quad \text{AND} \quad x > -4$$



$$-4 < x < 20$$

$$\textcircled{4} \quad |x-2| < 7$$

$$x-2 < 7 \quad \text{AND} \quad \frac{-(x-2) < 7}{-1 \quad -1}$$

$$\frac{+2 \quad +2}{x < 9}$$

$$x-2 > -7$$

$$\frac{+2 \quad +2}{x > -5}$$

$$x < 9 \quad \text{AND} \quad x > -5$$



$$-5 < x < 9$$

$$\textcircled{5} \quad |x-3| > -10$$

Special Case

$+ > -10$ always happens

\mathbb{R}

$$\textcircled{6} \quad |x+8| < -2$$

Special Case

$$+ < -2$$

Never happens so
No solution

$\emptyset \leftarrow$ null set

$$\textcircled{7} \quad |3x-1| > 4$$

$$\begin{array}{l} 3x-1 > 4 \\ \hline +1 \quad +1 \\ \hline 3x > 5 \\ \frac{3x}{3} > \frac{5}{3} \\ x > \frac{5}{3} \end{array} \quad \text{OR} \quad \begin{array}{l} -(3x-1) > 4 \\ \hline -1 \quad -1 \\ \hline 3x-1 < -4 \\ \hline +1 \quad +1 \\ \hline 3x < -3 \\ x < -1 \end{array}$$

$$x > \frac{5}{3} \text{ OR } x < -1$$

$$\textcircled{8} \quad |5x-1| < -2$$

↓

$$+ < -2$$

Never

No Solutions

11-30-17

$$|x| = 6$$

6 or -6

$$|x| \geq 4$$

↑
5, 6, 7, 8, ...
-5, -6, -7, -8.



Ex: $|x - 6| \geq 10$

$$\begin{array}{r} x - 6 \geq 10 \\ +6 \quad +6 \\ \hline x \geq 16 \end{array}$$

OR ~~$-(x - 6) \geq 10$~~

$$\begin{array}{r} x - 6 < -10 \\ +6 \quad +6 \\ \hline x < -4 \end{array}$$

$x \geq 16$ OR $x < -4$



② $|x + 5| \geq 7$

$$\begin{array}{r} x + 5 \geq 7 \\ -5 \quad -5 \\ \hline x \geq 2 \end{array}$$

OR ~~$-(x + 5) \geq 7$~~

$$\begin{array}{r} x + 5 < -7 \\ -5 \quad -5 \\ \hline x < -12 \end{array}$$

$x \geq 2$ OR $x < -12$



$$\textcircled{3} \quad |2x-1| > 9$$

$$\begin{array}{l} 2x-1 > 9 \quad \text{OR} \quad \underline{\underline{- (2x-1) > 9}} \\ \underline{\quad +1 \quad +1} \\ 2x > 10 \\ x > 5 \end{array} \qquad \begin{array}{l} \underline{\underline{- (2x-1) > 9}} \\ \underline{\quad -1 \quad -1} \\ 2x-1 < -9 \\ \underline{\quad +1 \quad +1} \\ 2x < -8 \\ x < -4 \end{array}$$

$$x > 5 \text{ OR } x < -4$$



$$\textcircled{4} \quad |x-2| < 10$$

$$\begin{array}{l} x-2 < 10 \quad \text{AND} \quad \underline{\underline{- (x-2) < 10}} \\ \underline{\quad +2 \quad +2} \\ x < 12 \end{array} \qquad \begin{array}{l} \underline{\underline{- (x-2) < 10}} \\ \underline{\quad -1 \quad -1} \\ x-2 > -10 \\ \underline{\quad +2 \quad +2} \\ x > -8 \end{array}$$

$$x < 12 \text{ AND } x > -8$$



$$-8 < x < 12$$

$$\textcircled{5} \quad |x+3| < 7$$

$$\begin{array}{l} x+3 < 7 \quad \text{AND} \quad \underline{\underline{- (x+3) < 7}} \\ \underline{\quad -3 \quad -3} \\ x < 4 \end{array} \qquad \begin{array}{l} \underline{\underline{- (x+3) < 7}} \\ \underline{\quad -1 \quad -1} \\ x+3 > -7 \\ \underline{\quad -3 \quad -3} \\ x > -10 \end{array}$$

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



$$-10 < x < 4$$

$$\textcircled{6} \quad |2x-1| < 7$$

$$\frac{2x-1 < 7 \quad \text{AND} \quad \frac{-(2x-1) < 7}{-1 \quad -1}}{+1 \quad +1}$$

$$\frac{2x < 8}{x < 4}$$

$$\frac{2x-1 > -7}{+1 \quad +1}$$
$$\frac{2x > -6}{x > -3}$$

$$x < 4 \quad \text{AND} \quad x > -3 \quad x > -3$$

$$-3 < x < 4$$

$$\textcircled{7} \quad |x-3| > -15$$

Special case

Always positive > -15

Every body works, so

\mathbb{R}

$$\textcircled{8} \quad |x+4| < -4$$

special case

$$+ < -4$$

Never happens, so

No solution

$\emptyset \leftarrow$ null set

11-30-17 4th Trig

$$|x| = 8$$

$$x = 8 \text{ or } x = -8$$

$$|x| > 5$$

$$6, 7, 8, 9, 10, 11, \dots$$

$$-6, -7, -8, -9, \dots$$

$$|x+3| > 10$$

$$x+3 > 10$$

$$\begin{array}{r} -3 \quad -3 \\ \hline \end{array}$$

$$x > 7$$

OR

$$\cancel{-(x+3)} > \cancel{10}$$

$$x+3 < -10$$

$$\begin{array}{r} -3 \quad -3 \\ \hline \end{array}$$

$$x < -13$$

$$x > 7 \text{ OR } x < -13$$



$$\textcircled{1} |x-1| > 8$$

$$x-1 > 8$$

$$\begin{array}{r} +1 \quad +1 \\ \hline \end{array}$$

$$x > 9$$

OR

$$\cancel{-(x-1)} > \cancel{8}$$

$$x-1 < -8$$

$$\begin{array}{r} +1 \quad +1 \\ \hline \end{array}$$

$$x < -7$$

$$x > 9 \text{ OR } x < -7$$



$$\textcircled{2} \quad |3x-1| > 7$$

$$\begin{array}{l}
 3x-1 > 7 \quad \text{OR} \quad \underline{\underline{- (3x-1) > 7}} \\
 \begin{array}{r}
 +1 \quad +1 \\
 \hline
 3x > 8 \\
 \frac{3x}{3} > \frac{8}{3} \\
 x > 2\frac{2}{3}
 \end{array}
 \end{array}
 \quad
 \begin{array}{l}
 3x-1 < -7 \\
 \begin{array}{r}
 +1 \quad +1 \\
 \hline
 3x < -6 \\
 \frac{3x}{3} < \frac{-6}{3} \\
 x < -2
 \end{array}
 \end{array}$$

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

$$\textcircled{3} \quad |x+6| < 10$$

$$\begin{array}{l}
 x+6 < 10 \quad \text{AND} \quad \underline{\underline{- (x+6) < 10}} \\
 \begin{array}{r}
 -6 \quad -6 \\
 \hline
 x < 4
 \end{array}
 \end{array}
 \quad
 \begin{array}{l}
 x+6 > -10 \\
 \begin{array}{r}
 -6 \quad -6 \\
 \hline
 x > -16
 \end{array}
 \end{array}$$

$$x < 4 \text{ and } x > -16$$



$$-16 < x < 4$$

$$\textcircled{4} \quad x < 11 \text{ AND } x > -1$$



$$-1 < x < 11$$

$$\textcircled{5} \quad |x+8| < 1$$

$$\begin{array}{l}
 x+8 < 1 \quad \text{AND} \quad \underline{\underline{- (x+8) < 1}} \\
 \begin{array}{r}
 -8 \quad -8 \\
 \hline
 x < -7
 \end{array}
 \end{array}
 \quad
 \begin{array}{l}
 x+8 > -1 \\
 \begin{array}{r}
 -8 \quad -8 \\
 \hline
 x > -9
 \end{array}
 \end{array}$$

$$x < -7 \text{ AND } x > -9 \quad x > -9$$



$$-9 < x < -7$$

$$\textcircled{6} \quad |3x-5| < 10$$

$$3x-5 < 10 \quad \text{AND} \quad \cancel{-(3x-5) < 10}$$
$$\frac{+5 \quad +5}{3x < 15} \qquad \frac{+5 \quad +5}{3x > -5}$$
$$x < 5$$

$$x < 5 \quad \text{AND} \quad x > -\frac{2}{3} \quad x > -\frac{2}{3}$$



$$-\frac{2}{3} < x < 5$$

$$\textcircled{7} \quad |x+7| > -8$$

Special case

$$+ > -8$$

Always happens, so

\mathbb{R}

$$\textcircled{8} \quad |x-2| < -4$$

Special case

$$+ < -4$$

Never happens, so

NO SOLUTIONS

$\emptyset \leftarrow$ null set

$$\textcircled{9} \quad |3x-1| > -84$$

$$+ > -84$$

\mathbb{R}