

WARMUP

Find 2 solutions to each, one negative and one positive

$$|A| = 5$$

$$A = 5$$

$$A = -5$$

$$|A| < 5$$

$$A = 4$$

$$A = -1$$

$$|A| > 5$$

$$A = 7$$

$$A = -20$$

Section 9.3 Absolute Value Equations and Inequalities

To solve an absolute value equation $|x| = c$

set $x = c$ or $x = -c$

$$|x| = -7$$

no solutions

ex: $|2x - 3| = 11$

$$\begin{array}{rcl} 2x - 3 & = & 11 \\ +3 & +3 & \\ \hline \end{array} \quad \text{or} \quad \begin{array}{rcl} 2x - 3 & = & -11 \\ +3 & +3 & \\ \hline \end{array}$$

$$2x = \frac{14}{2}$$

$$x = 7$$

$$2x = -\frac{8}{2}$$

$$x = -4$$

7 and -4 or $\{7, -4\}$

$$\underline{\text{ex:}} \quad 2 |1-3x| - 28 = 0$$

$$\quad \quad \quad +28 \quad +28$$

$$\cancel{2} |1-3x| = \frac{28}{\cancel{2}}$$

$$|1-3x| = 14$$

$$\begin{array}{r} \cancel{1}-3x = 14 \\ \hline -1 \\ \hline -3x = 13 \\ \hline -3 \quad -3 \\ \hline x = -\frac{13}{3} \end{array}$$

or

$$\begin{array}{r} 1-3x = -14 \\ \hline -1 \quad -1 \\ \hline -3x = -15 \\ \hline -3 \quad -3 \\ \hline x = 5 \end{array}$$

$$x = -\frac{13}{3}$$

$$x = 5$$

$$\boxed{-\frac{13}{3} \text{ and } 5}$$

$$\underline{\text{ex:}} \quad |2x-7| \leq 15$$

1) Solve the corresponding equation: $|2x-7| = 15$

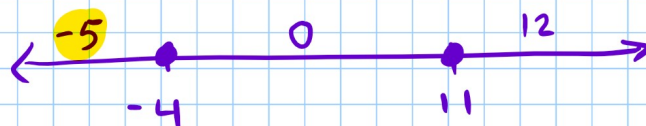
$$\begin{array}{r} 2x-7 = 15 \\ \hline +7 \quad +7 \\ \hline 2x = 22 \\ \hline \frac{2x}{2} = \frac{22}{2} \\ \hline x = 11 \end{array}$$

$$\begin{array}{r} 2x-7 = -15 \\ \hline +7 \quad +7 \\ \hline 2x = -8 \\ \hline \frac{2x}{2} = \frac{-8}{2} \\ \hline x = -4 \end{array}$$

2) Put answers on a number line. Those answers define 3 intervals.

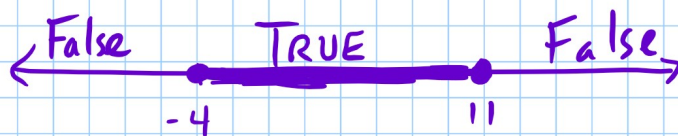


3) Pick a test value in each interval



4) Put those test values into inequality to see if it's true.

$$|2x-7| \leq 15$$



$$|2(-5)-7| \leq 15$$

$$|-17| \leq 15$$

$$17 \leq 15$$

$$|2 \cdot 0 - 7| \leq 15$$

$$|-7| \leq 15$$

$$7 \leq 15$$

$$|2 \cdot 12 - 7| \leq 15$$

$$|17| \leq 15$$

$$17 \leq 15$$

5) The true segments form your answer

$$[-4, 11]$$

ex: $|3x+2| > 11$

$$\begin{array}{r} 3x + 2 = 11 \\ -2 \quad -2 \\ \hline 3x = 9 \\ \frac{3}{3} \quad \frac{3}{3} \\ \hline x = 3 \end{array}$$

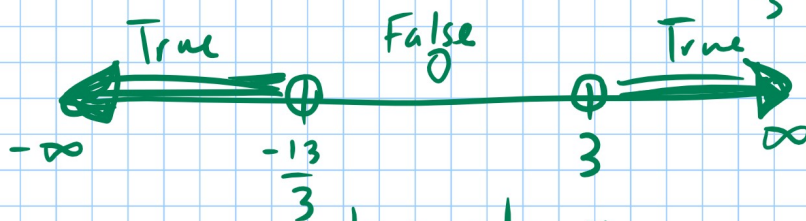
$$x = 3$$

$$x = 3$$

$$\begin{array}{r} 3x + 2 = -11 \\ -2 \quad -2 \\ \hline 3x = -13 \\ \frac{3}{3} \quad \frac{3}{3} \\ \hline x = -\frac{13}{3} \end{array}$$

$$x = -\frac{13}{3}$$

$$x = -\frac{13}{3}$$



$$|3 \cdot 0 + 2| > 11$$

$$|2| > 11$$

$$2 > 11$$

False

$$(-\infty, -\frac{13}{3}) \cup (3, \infty)$$

BEWARE :
$$\begin{array}{r} 5 + |x-3| > 4 \\ -5 \quad \quad -5 \end{array}$$

$$|x-3| > -1$$

all real numbers
work

$$(-\infty, \infty)$$

p 637

1-21 eoo, 45
49, 53, 63, 65

BEWARE Part 2:

$$\begin{array}{r} 7 + |x-7| \leq -3 \\ -7 \quad \quad -7 \end{array}$$

$$|x-7| \leq -10$$

no solutions

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