

1.8 Absolute Value Equations & Inequalities

Obj: 1. Write, solve, & graph absolute value eqs & ineqs.

$$|-3| = 3$$

Absolute Value: measures the distance from zero.
always positive!

-3 0 3

$|-3| = 3$ $|3| = 3$

Sep 4-9:10 AM

Absolute Value Equations

If $|x| = a$ then:
 $x = a$ $x = -a$

Solve & graph:

$$|2x+3| = 4$$

| | |
|------------------------------|-------------------------------|
| $2x+3=4$ | $2x+3=-4$ |
| $-3 \quad -3$ | $-3 \quad -3$ |
| $\frac{2x}{2} = \frac{1}{2}$ | $\frac{2x}{2} = \frac{-7}{2}$ |
| $x = \frac{1}{2}$ | $x = \frac{-7}{2}$ |

$-\frac{7}{2}$ $\frac{1}{2}$

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$$|3x+5| = 7$$

$$3x+5=7$$

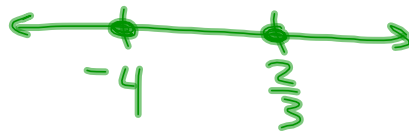
$$\frac{3x}{3} = \frac{2}{3}$$

$$x = \frac{2}{3}$$

$$3x+5=-7$$

$$\frac{3x}{3} = \frac{-12}{3}$$

$$x = -4$$



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Solve & check: $|x-3| = 3x+5$

$$x-3 = 3x+5$$

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

$$x = -4$$

$$x-3 = -(3x+5)$$

$$x-3 = -3x-5$$

$$\frac{4x}{4} = \frac{-2}{4}$$

$$x = -\frac{1}{2}$$

check:

$$|-4-3| = 3(-4)+5$$

$$|-7| = -7$$

$$|-\frac{1}{2}-3| = 3(-\frac{1}{2})+5$$

$$|-3.5| = 3.5 \checkmark$$

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Solve & check: $|2x+1| = x+5$

$$2x+1 = x+5$$

$$x = 4$$

check: $|2(4)+1| = 4+5$
 $|9| = 9 \checkmark$

$$2x+1 = -(x+5)$$

$$2x+1 = -x-5$$

$$3x = -6$$

$$x = -2$$

check: $|2(-2)+1| = -2+5$
 $|-3| = 3 \checkmark$

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Solve & check: $|x-4| = x+1$

~~$$x-4 = x+1$$~~

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

~~$$x-4 = -x-1$$~~

~~$$2x = 3$$~~

~~$$x = \frac{3}{2} = 1.5$$~~

check: $|1.5-4| = 1.5+1$
 $|-2.5| = 2.5 \checkmark$

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Absolute Value Inequalities

If $|x| < a$ then $x < a$ and $x > -a$
 "less than"

If $|x| > a$ then $x > a$ or $x < -a$
 "great-or"

Solve & graph: $|5-3x| > 9$ great-or

$$\begin{array}{l} 5-3x > 9 \quad \text{or} \quad 5-3x < -9 \\ -5 \quad -5 \quad -5 \quad -5 \end{array}$$

$$\begin{array}{l} \frac{3x}{-3} > \frac{4}{-3} \quad \text{or} \quad \frac{3x}{-3} < \frac{-14}{-3} \\ x < -\frac{4}{3} \quad \text{or} \quad x > \frac{14}{3} \end{array}$$

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Solve & graph: $|5x-3| < 7$ less than

$$\begin{array}{l} 5x-3 < 7 \quad \text{and} \quad 5x-3 > -7 \\ +3 \quad +3 \quad +3 \quad +3 \\ \frac{5x}{5} < \frac{10}{5} \quad \text{and} \quad \frac{5x}{5} > \frac{-4}{5} \\ x < 2 \quad \text{and} \quad x > -\frac{4}{5} \end{array}$$

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$$\boxed{|5x+2|} - 2 = 6$$

* isolate the absolute value first!
(before you write 2 eqs or ineqs)

$$|5x+2| = 8$$

$$5x+2=8$$

$$-2 \quad -2$$

$$5x=6$$

$$x = \frac{6}{5}$$

$$5x+2=-8$$

$$-2 \quad -2$$

$$5x=-10$$

$$x = -2$$

Sep 4-11:57 AM