Topic 1.8

Absolute Value Equations and Inequalities

MyMathLab[®] eCourse Series **COLLEGE ALGEBRA Student Access Kit** Third Edition KIRK TRIGSTED

OBJECTIVES



- 1. Solving an Absolute Value Equation
- Solving an Absolute Value "Less Than" Inequality
- **3.** Solving an Absolute Value "Greater Than" Inequality

Solving Absolute Value Equations and Inequalities



Solutions to

$$|x| = 5$$



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Solving Absolute Value Equations and Inequalities





Solving Absolute Value Equations and Inequalities

Absolute Value Equations and Inequality Properties

Let *u* be an algebraic expression and *c* be a real number such that c > 0, then

1.
$$|u| = c$$
 is equivalent to $u = -c$ or $u = c$.

2.
$$|u| < c$$
 is equivalent to $-c < u < c$.

3. |u| > c is equivalent to u < -c or u > c.

Solving an Absolute Value Equation

Solve
$$|1 - 3x| = 4$$
.

$$1 - 3x = 4$$
 or $1 - 3x = -4$

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

$$x = -1$$
 or $x = \frac{5}{3}$

The solution set is
$$\left\{-1,\frac{5}{3}\right\}$$
. $\left\{-1,\frac{5}{3}\right\}$.

Solving an Absolute Value "Less Than" Inequality

Solve
$$|4x-3|+2 \le 7$$
.
 $|4x-3| \le 5$
 $-5 \le 4x-3 \le 5$
 $-2 \le 4x \le 8$
 $-\frac{1}{2} \le x \le 2$

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Set-builder notation:

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

Interval notation:

$$\left[-\frac{1}{2},2\right]$$



Solving an Absolute Value "Greater Than" Inequality

- Solve |5x+1| > 3.
- 5x + 1 < -3 or 5x + 1 > 3
 - 5x < -4 or 5x > 2

$$x < -\frac{4}{5}$$
 or $x > \frac{2}{5}$

Set-builder notation:

$$\left\{ x \middle| x < -\frac{4}{5} \text{ or } x > \frac{2}{5} \right\}$$

Interval notation:

$$\left(-\infty,-\frac{4}{5}\right)\cup\left(\frac{2}{5},\infty\right)$$



Solving an Absolute Value "Greater Than" Inequality

Solve each of the following

a. |3x-2|=0

3x - 2 = 03x = 2 $x = \frac{3}{2}$

b. |x+6| = -4

The absolute value of an expression can never be less than zero.

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c. $|7x+5| \le 0$

The absolute value of an expression can never be less than zero.

7x + 5 = 07x = -5 $x = -\frac{5}{7}$