Math 176, Section 1121, Fall 2007
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Course Notes

Chapter 1.7 - Absolute Value Equations & Inequalities

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Formal Definition of Absolute Value:

$$|a| = \begin{cases} -a \text{ if } a < 0 \\ a \text{ if } a \geq 0 \end{cases}$$

Example 1: Solve $|2x - 3| = 11$

$2x - 3 = 11$	$2x - 3 = -11$
$2x = 14$	$2x = 8$
$x = 7$	$x = 2$

Example 2: Solve $|3x + 4| - 8 = -15$

$|3x + 4| = -15 + 8$

$|3x + 4| = -7$

NO SOLUTION

An absolute value can never equal a negative number.

Example 3: Solve $-2 + |-4x - 7| = 11$

$|-4x - 7| = 11 + 2$

$|-4x - 7| = 13$

$-4x - 7 = 13$	$-4x - 7 = -13$
$-4x = 13 + 7$	$-4x = -13 + 7$
$-4x = 20$	$-4x = -6$
$x = \frac{20}{-4} = -5$	$x = \frac{-6}{-4} = \frac{3}{2}$

Let's discuss $|x| < 5$ versus $|x| > 5$

Example 4: Solve $|3x - 1| < 5$

$3x - 1 < 5$	$3x - 1 < -5$
$3x < 5 + 1$	$3x < -5 + 1$
$3x < 6$	$3x < -4$
$x < \frac{6}{3}$	$x < \frac{-4}{3}$
$x < 2$	

Example 5: Solve $|2x - 5| \geq 3$

$2x - 5 \geq 3$	$2x - 5 \geq -3$
$2x \geq 3 + 5$	$2x \geq -3 + 5$
$2x \geq 8$	$2x \geq 2$
$x \geq \frac{8}{2}$	$x \geq 1$
$x \geq 4$	

Example 6: Solve $|4x - 3| \leq -2$

NO SOLUTION

An absolute value can never equal a negative number.

Example 7: Solve $|-2x + 7| > -8$

$-2x + 7 > -8$	$-2x + 7 > -(-8)$
$-2x > -8 - 7$	$-2x + 7 > 8$
$-2x > -15$	$-2x > 8 - 7$
$x > \frac{-15}{-2}$	$-2x > 1$
$x > 7.5$	$x > \frac{1}{-2}$