Section 1.6

Equations and Inequalities Involving Absolute Value

ABSOLUTE VALUE

Let a be a real number. The **absolute value of a**, denoted by $|a|$, is

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

This simply measures how far the number a is from 0 on the number line.

SOLVING EQUATIONS INVOLVING ABSOLUTE VALUE

To solve an equation involving one absolute value symbol, we use the following Theorem

Theorem: If a is a positive real number and if u is any algebraic expression, then

$$|u| = a \quad \text{is equivalent to} \quad u = a \quad \text{or} \quad u = -a.$$

SOLVING ABSOLUTE VALUE INEQUALITIES

To solve an inequality involving one absolute value symbol, we use one of the following Theorems.

Theorem: If a is a positive real number and if u is any algebraic expression, then

$$|u| < a \quad \text{is equivalent to} \quad -a < u < a$$

$$|u| \leq a \quad \text{is equivalent to} \quad -a \leq u \leq a$$

In other words, $|u| < a$ is equivalent to $-a < u$ and $u < a$.

Theorem: If a is a positive real number and if u is any algebraic expression, then

$$|u| > a \quad \text{is equivalent to} \quad u < -a \quad \text{or} \quad u > a$$

$$|u| \geq a \quad \text{is equivalent to} \quad u \leq -a \quad \text{or} \quad u \geq a$$