**Section 1.7—Linear Inequalities and Absolute Value Inequalities**

**Solving an Inequality**—the process of finding the set of numbers that make the inequality a true statement

**Interval Notation**—used to represent subsets (small collections) of real numbers

**Open Interval**—(a, b) represents the set of real numbers between, but not including a & b

* x is greater than a AND less than b

**Closed Interval**—represents the set of real numbers between and including the points a & b

* x is greater than or equal to a AND less than or equal to b

**Infinite Interval**— represents the set of real numbers greater than a

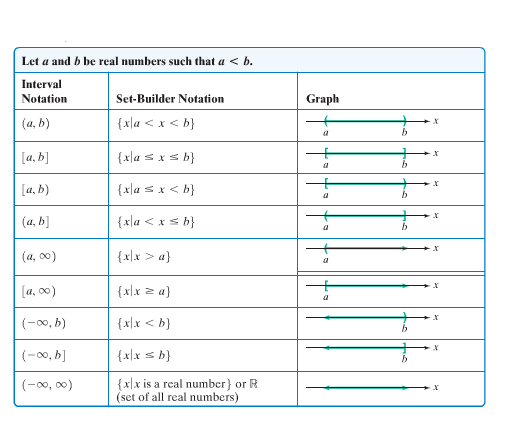
* the infinity symbol does not represent a real number; it indicates that the interval extends indefinitely to the right

**Infinite Interval**— represents the set of real numbers that are less than or equal to b

* the infinity symbol does not represent a real number; it indicates that the interval extends indefinitely to the left

**Parentheses indicate endpoints that are not included in an interval.**

**Square brackets indicate endpoints that are included in an interval.**

The following table lists nine possible types of intervals used to describe the subset of numbers.

**Example**—Express each interval in set-builder notation and graph.

**Intersections and Unions of Intervals**

**Intersection**—set of elements that are common to both set A and set B; denoted

**Union**—set of elements that are in both set A or set B or both sets; denoted

**Finding Intersections and Unions of Intervals**

1. Graph each interval on a number line
2. Determine if you are looking for the intersection or union
   1. **Intersection**—take the portion of the number line that the two graphs have in common
   2. **Union**—take the portion of the number line that represents the total collection of numbers in the two graphs

**Example**—Use graphs to find each set

**Solving Linear Inequalities**

A linear inequality can be written in one of the following forms: , , , or .

What happens when you add, subtract, multiply or divide each side of an inequality by positive and negative numbers?

**When you multiply or divide both sides of an inequality by a negative number, reverse the inequality symbol.**

**Example**—Solve and graph the solution set on a number line

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If there is no solution to an inequality, the solution set is the empty set, .

If an inequality is true for all real numbers, the solution set is or

**Example**—Solve each inequality

**Compound Inequality**—two inequalities written as one statement

* For example: can be written as the single compound inequality

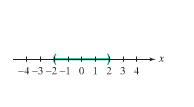
An intersection is implied when you have a compound inequality.

The goal in solving an inequality is to isolate the variable in the middle.

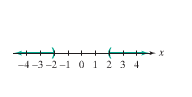
You must perform the same operation on all three parts!!!

**Example**—Solve and graph the solution set on a number line

**Solving Inequalities with Absolute Value**

When less than is used in an absolute value inequality, it means the distance from x is less than the value.

For example: means that the distance of x from 0 is less than 2; thus x can lie between -2 and 2. We would write that as (-2, 2) or

When greater than is used in an absolute value inequality, it means the distance from x is greater than the value.

For example: means that the distance of x from 0 is greater than 2; thus x can be less than -2 or greater than 2. We would write ; in interval notation as

If X is an algebraic expression and c is a positive number,

1. The solutions of are the numbers that satisfy
2. The solutions of are the numbers that satisfy

These rules apply for , when replacing < and > respectively.

**Example**—Solve and graph the solution set on a number line:

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