1.5 Inequalities

Properties of Inequalities and Compound Inequalities

Solve inequalities the same way you solve an equation. However, when you multiply or divide an inequality by a negative #, you must reverse the direction of the inequality.

Writing Inequality Solutions:

can be expressed in 4 different forms

(Section P-1in your textbook has details on each method)

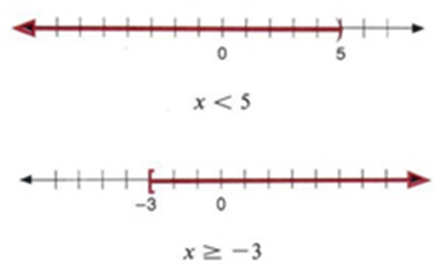
Inequality: a statement that 2 values are not equal using $>, <, \geq, \leq$

$x > 3$ $x \geq 7$

Set-builder notation: represents the elements of an inequality in Set notation

$\{x \mid x > 5\}$ which is read "the set of x such that x is greater than 5"

Graph: single variable inequalities are graphed on a number line using the following symbols:

○, (or) for < and > ●, [or] for ≥ and ≤	

Interval notation: shows a range of numbers using

[or] for $\geq$ or $\leq$ and (or) for $>$ or $<$

$x > 5$ in interval notation is **$(5, \infty)$** $x \leq 7$ in interval notation is **$(-\infty, 7]$**

A compound inequality would have 2 or more intervals and a U (union) symbol between each.

$x < -3$ and $x \geq 2$ in interval notation is **$(-\infty, -3) \cup [2, \infty)$**

A compound inequality is formed by joining two inequalities with a connective word such as ***and*** or ***or***.

Examples:

1. $x + 4 > 3x + 16$ 2. $4x + 1 > -2$ and $4x + 1 \leq 17$

3. $x + 1 > 4$ or $x + 2 \leq 3$

4. $0 \leq 3x - 1 \leq 10$

<u>Absolute Value Inequalities</u>

If $|x| < a$, then $-a < x < a$

Consider $|x| < 6$

$|x| < 6$

If $|x| > a$, then $x < -a$ or $x > a$

Consider $|x| > 4$

Examples: (give answers in interval notation)

1. Solve: $|5 - 2x| < 7$

2. Solve $|4x - 5| \geq 7$

Polynomial Inequalities

To solve a polynomial inequality using the test point method (***Critical Value Method***):

1. Rewrite the inequality, if necessary, so that one side is 0.
2. Solve the inequality as if it were an equation – find critical values.
3. Use the solutions (critical values) to divide the number line into intervals.
4. Substitute a test point from each interval to see whether the expression is true or false (or use sign diagram).
5. Find the interval(s) that satisfy the inequality.

Examples:

1. Solve $x^2 - 2x > 3$ 2. Solve $x^2 + 5x + 6 < 0$

Solve a Rational Inequality

Critical Value – in a rational expression is any value that causes the numerator or denominator to equal zero (0).

To solve a rational inequality:

1. Find the value(s), if any that make the numerator zero. Find the value(s), if any that make the denominator zero.
2. Use these values to divide the number line into intervals.
3. Substitute a test point from each interval into the rational expression to determine the sign of the express in that interval.
4. Find the intervals that satisfy the inequality.

Examples:

1. Solve $\frac{x+4}{x-1} \leq 0$
2. Solve $\frac{(x-3)(x-5)}{x+2} \geq 0$