B. 4 - Solving Inequalities Algebraically & Graphically

 **What will you learn???** 

- To use properties of inequalities to solve l inear inequalities
- To solve inequalities involving absolute values
- To solve polynomial inequalities
- To solve rational inequalities
- To use inequalities to model and solve real-life problems

Properties of Inequalities

Let *a*, *b* and *c* be real numbers

1. **Transitive Property**

2. **Addition of Inequalities**

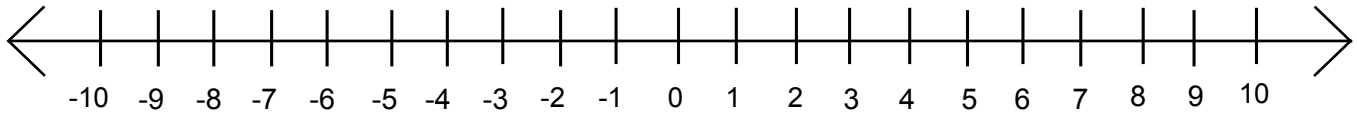
3. **Addition of a Constant**

   What happens to an inequality when you multiply by a negative number???

4. **Multiplying by a Constant**

Example 1 - Solving a Linear Inequality

$$5x - 7 > 3x + 9$$



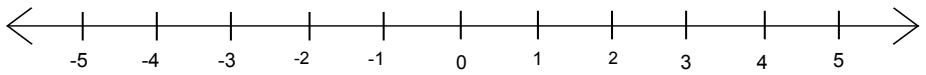
See p. A72; exercise 11

Example 2 - Solving an Inequality

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

Algebraic

Graphical

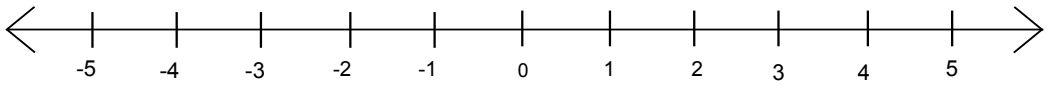


See p. A72; exercise 13

Example 3 - Solving a Double Inequality

$$-3 \leq 6x - 1 \quad \text{and} \quad 6x - 1 < 3$$

Algebraic **Graphical**



See p. A72; exercise 15

Inequalities Involving Absolute Value

Let x be a variable or an algebraic expression and
let a be a real number *s. t.* $a \geq 0$

1. **The solutions of $|x| < a$ are all values of x that lie between $-a$ and a.**

   $$x < a \quad \textit{iff} \quad -a < x < a$$

2. **The solutions of $|x| > a$ are all values of x that are less than $-a$ or graeater than a .**

   $$x > a \quad \textit{iff} \quad x < -a \quad \textit{or} \quad x > a$$

Remember???? **"less than"** → **and**
" greater than" → **or**

Example 4 - Solving Absolute Value Inequalities

a.) $|x - 5| < 2$

Algebraic Graphical

b.) $|x - 5| > 2$

Algebraic Graphical

See p. A72; exercise 29

Polynomial Inequalities

$$x2 - 2x - 3 = (x - 3) (x + 1)$$

Divides the number line into intervals
Test one value in each interval

Example 5 - Investigating Polynomial Behavior

Use the zeros to find intervals on the number line
Determine whether the polynomial is positive of negative in each interval

$$x2 - x - 6$$

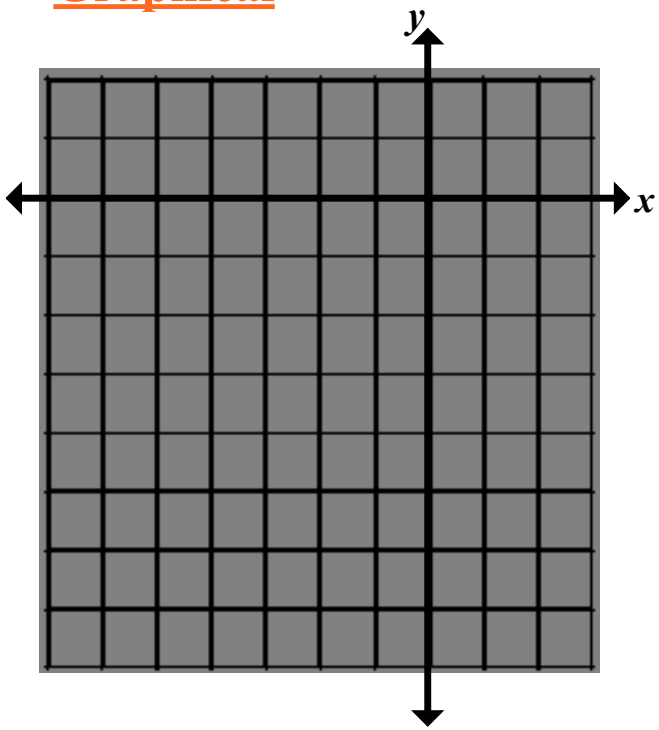
See p. A73; exercise 43

Example 6 - Solving a Polynomial Inequality

$$2x2 + 5x > 12$$

Algebraic

Graphical



Critical Numbers (zeros) :_____

Intervals : _____

See p. A 73; exercise 47

Example 7 - Solving a Polynomial Inequality

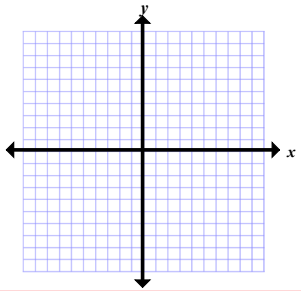
$$2x3 - 3x2 - 32x > -48$$

Critical Numbers (zeros):_____

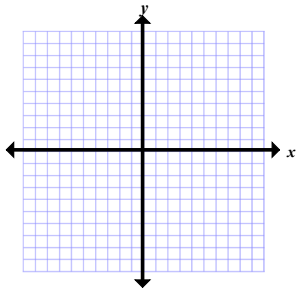
See p. A73; exercise 49

Example 8 - Unusual Solution Sets

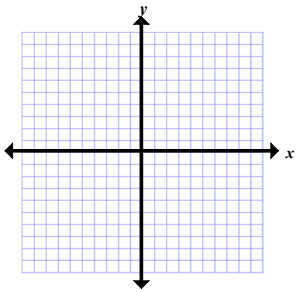
a.) $x2 + 2x + 4 > 0$



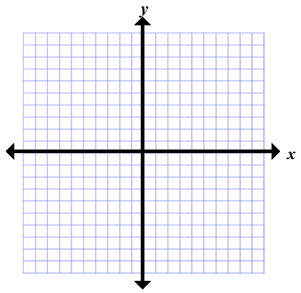
b.) $x2 + 2x + 1 \leq 0$



c.) $x2 + 3x + 5 < 0$



d.) $x2 - 4x - 4 > 0$



Rational Inequalities

Remember....a rational expression can only change signs at its

zeros
&
undefined values } Critical Numbers

Example 9 - Solving a Rational Inequality

$$\frac{2x - 7}{x - 5} \leq 3$$

Algebraic **Graphical**

Rewrite

Critical Numbers: _____

Intervals:_____

See p. A73; exercise 55

Implied Domain set of all x values for which the function is defined

Example 10 - Finding the Domain of an Expression

Find the domain of $\sqrt{64 - 4x^2}$

See p. A73; exercise 63

Example 11 - Height of a Projectile

A projectile is fired straight upward from ground level with an initial velocity of 384 ft/sec.
During what time period will its height exceed 200 ft?

Position Equation $s = -16t^2 + v_0 t + s_0$

s = height (feet)
t = time (seconds)

See p. A73; exercise 65