

## Lesson 4.4 (F'11)

- Objectives: To solve:
- Radical equations
  - Equations with rational powers
  - Absolute value equations
  - Quadratic inequalities
  - Power inequalities

### Steps to Solve Radical Equations or Equations Involving Radical Powers

- Isolate a single radical on one side of the equation.
- Square both sides or raise to a power that is equal to the index of the radical.
- If a radical remains, repeat steps 1 and 2
- Solve the resulting equation.
- CHECK all solutions to make sure you did not pick up any that will not work in the original equation.

EXAMPLES: Solve

1.  $\sqrt{x+4}-4=x$

2.  $\sqrt{3x^2+4}=2x$

3. #10  $\sqrt{x}-10=-\sqrt{x-20}$  Use your calculator

4.  $\sqrt[3]{x-2}=3$

5.  $(x-5)^{\frac{3}{2}}=64$

REMEMBER

Absolute Value Equations

$|x|=a$  and  $a > 0$ , then  $x = a$  or  $x = -a$ .

There is no solution to  $|x|=a$  if  $a < 0$ :  $|x|=0$  has solution  $x = 0$

## Quadratic Inequalities

A **quadratic inequality** is an inequality that can be written in the form  $ax^2 + bx + c > (< \text{etc})0$ , where  $a$ ,  $b$ , and  $c$  are real numbers and  $a$  is not zero.

Let's look at two methods to solve this inequality.

### Analytically

Steps

- a. Write an equivalent inequality with 0 on one side  
(  $f(x) > 0$  )
- b. Solve  $f(x) = 0$
- c. Use a Sign chart (tree diagram) to find appropriate intervals which make the inequality true.

Examples: Solve

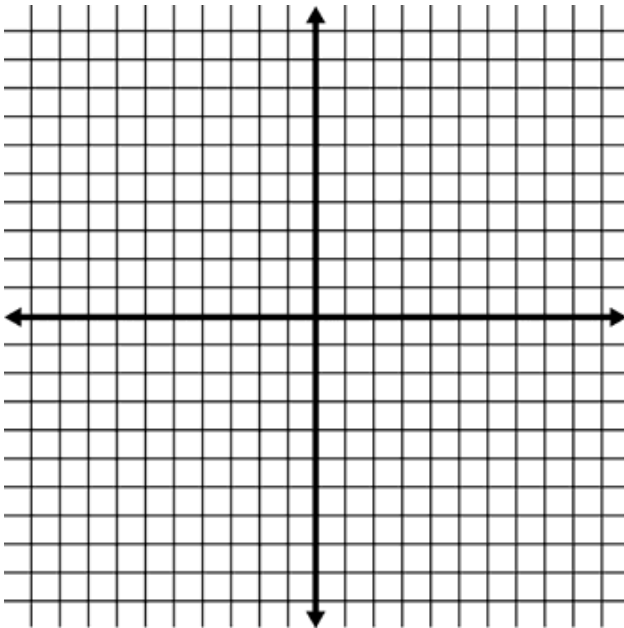
1.  $x^2 - 8x > 0$

2.  $x^2 + 7x < 5x + 35$

3.  $3x^2 + 13x - 10 \geq 0$

**Graphically**

Solve  $2x^2 < 5x + 6$



## Applications

EXAMPLE#48 The low long-range world population numbers and projects for the years 1995-2150 are given by the equation  $y = -0.00036x^2 + 0.0385x + 5.823$ , where  $x$  is the number of years after 1990 and  $y$  is **in billions**. During what years does this model estimate that the population was above 6 billion?

EXAMPLE #54 The domestic sales of tobacco (in millions of kilograms) in Canada is given by  $y = -0.084x^2 + 1.124x + 4.028$ , where  $x$  is the number of years from 1986 does this model indicate that sales will exceed 6,643,000 kilograms?

## POWER INEQUALITIES

To solve a power inequality, first solve the related equation. Then use graphical methods to find the values of the variable that satisfy the inequality.

The future value of \$3000 invested for 3 years at rate  $r$ , compounded annually, is given by  $S = 3000(1+r)^3$ . What interest rate will give a future value of at least \$3630? Our equation becomes  $3000(1+r)^3 \geq 3630$ .

First solve:

$3000(1+r)^3 = 3630$  Divide both sides by 3000.

$(1+r)^3 = 1.21$  Take the cube root of both sides

$1 + r =$

$r =$

Now graph  $3000(1+r)^3$  in  $y_1$  and 3630 in  $y_2$ . Let's see where  $3000(1+r)^3$  is above 3630.

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