

## Lesson 2.1 & 2.3 (F11)

- Objectives:
1. To solve linear equation both algebraically and graphically
  2. To find the zeros, x and y intercepts of a linear function
  3. To solve formulas for a specific variable
  4. To solve a system of linear equation by; substitution, elimination, graphing (calculator)
  5. To find the break-even point
  6. To model systems of equations

### Solving Linear Equations Algebraically (Steps page 94)

Solve:

1)  $6(3x - 1) = 8 - (10x - 14)$

2)  $\frac{3}{4} + \frac{1}{5}x - \frac{1}{2} = \frac{4}{5}x$

EXAMPLE #52<sub>(page 104)</sub> The capita tax burden  $B$  can be described by  $B(t) = 17.69 + 2.25t$  **hundred** dollars, where  $t$  is the number of years past 1980. In what year does this model indicate that the per capita tax burden was \$4694?

### Solutions, Zeros, and x-intercepts

Any number  $a$  for which  $f(a) = 0$  is called a **zero** of the function  $f(x)$ . If  $a$  is real,  $a$  is an x-intercept of the graph of the function.

**The following three concepts are numerically the same:**

1. The x-intercept of the graph of  $y = f(x)$
2. The real zeros of the function  $f$ .
3. The real solutions to the equation  $f(x) = 0$

Example: Given the function  $f(x) = 15x - 45$ , find:

- a)  $f(3)$
- b) the zero of  $f(x)$
- c) the x-intercept of the graph of  $f(x)$
- d) the solution to the equation  $15x - 45 = 0$

Graphically solutions of Linear Functions  
TWO METHODS FOR SOLVING EQUATIONS WITH  
THE GRAPHING CALCULATOR

I. X-Intercept Method<sub>(page 97)</sub>

- Steps:
- 1) Write the equation in the form  
    { expression in x } = 0
  - 2) Graph  $Y_1 = \{ \text{expression in } x \}$
  - 3) Use ZERO (or ROOT) to find the x-intercepts  
    Note **MATH** then **FRAC** will usually convert a decimal to a fractional (exact) answer

Example: #8<sub>(page 102)</sub>       $\frac{4(x-2)}{5} - x = 6 - \frac{x}{3}$

II. Intersection Method

- Steps:
- 1) Enter  $Y_1 =$  left side of equation
  - 2) Enter  $Y_2 =$  right side of equation
  - 3) Graph these two equations
  - 4) Find where they intersect using 2nd TRACE  
    #5:INTERSECT

Example:  $\frac{4(x-2)}{5} - x = 6 - \frac{x}{3}$

EXAMPLE: #53 The profit from the production and sale of specialty golf hats is given by the function  $P(x) = 20x - 4000$  where  $x$  is the number of hats produced and sold.

- a) Producing and selling how many units will give a profit of \$8000?
- b) How many units must be produced and sold to avoid a loss?

### Solving a Formula for a Specific Variable

An equation that contains two or more variable is called a **literal** equation.

EXAMPLE: The formula for the future value of an investment of \$ $P$  at simple interest rate  $r$  for  $t$  years is  $A = P(1 + rt)$ . Solve the formula for  $t$ , years.

Try this--Solve  $3x + 5y = 15$  for  $y$ .

## Graphical Solutions of Systems of Equations

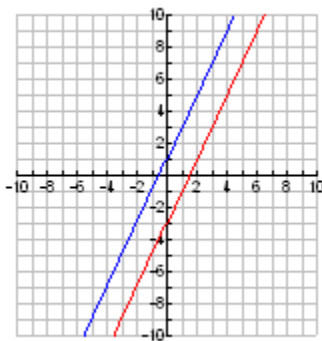
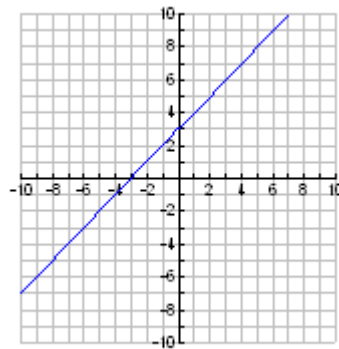
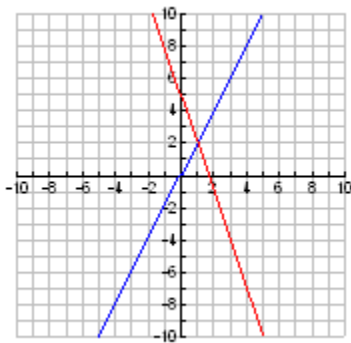
### BREAK EVEN POINT

$$\text{Revenue} = \text{Cost} \quad \text{or} \quad \text{Profit} = \text{Revenue} - \text{Cost} = 0$$

#### EXAMPLE-

The revenue and cost of a certain product are given by  $R = 4x$  and  $C = 2x + 1000$  where  $x$  is the number of units produced and sold. Use graphically methods to find the number of units needed to break even.

### Possibilities for Systems of Equations



## Solving by Substitution (STEPS 130)

EXAMPLE: Solve by substitution.  $2x - 4y = -8$   
 $7x - y = 11$

**Market Equilibrium** occurs when the supply quantity equals the demand quantity. (and the prices are equal)

**Surplus**- supply exceeds demand    **Shortfall**-demand exceeds supply

EXAMPLE: #36 (page 111) The demand for a brand of clock radio is given by  $p + 2q = 320$ , and the supply for these radios is given by  $p - 8q = 20$ , where  $p$  is the price and  $q$  is the quantity demanded at price  $p$ .

- a. If the price is \$180, what is the supply?    And demand?
  
  
  
  
  
  
  
  
  
  
- b. Solve the system containing these two equations to find the price at which the quantity demanded equals the quantity supplied and the equilibrium quantity.

Example: #48 (page 139) A woman invests \$250,000 in two rental properties. One yields an annual return of 10% of her investment., and the other returns 12% per year on her investment. Her total annual return from the two investments is \$26,500. Let  $x$  represent the amount of the 10% investment and  $y$  represent the amount of the 12% investment. Write a system of equations that would represent the problem. Solve these two equations simultaneously to find how much is invested in each property.

Homework: Course Compass for section 2.1 and 2.3 and bookwork page 102 #7, 25, 27, 47 no bookwork for 2.3