Lesson 2.1 & 2.3 (S'11)

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(page 104) 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? (Remember B(t) is in hundreds thus 4694 is 46.94 hundreds)

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) find 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 (page 97)

Steps:
1) Write the equation in the form
   {expression in x} = 0
2) Graph Y_1 = {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 (page 102)

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

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 $A = P(l + rt)$. Solve the formula for t, years.

EXAMPLE: Solve $3x + 5y = 15$ for y.

Graphical Solutions of Systems of Equations

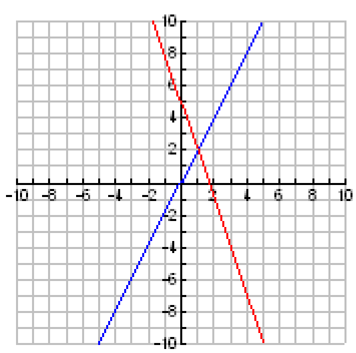
BREAK EVEN POINT

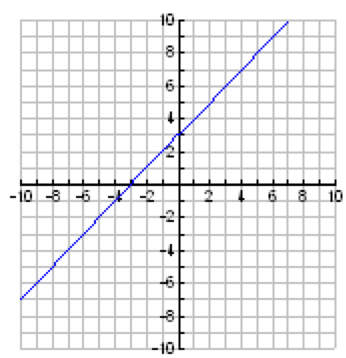
Revenue = Cost   or   Profit = Revenue - Cost = 0

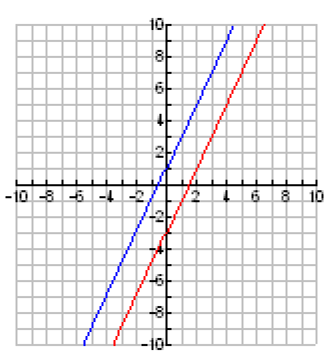
EXAMPLE-

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

DUE BY_________________________________