

Lesson C.1 – Classifying Systems of Equations

and Solving them Graphically

 Definitions:

 1. A System of Equations is a set of two (or more) equations.

2. Solving a system of equations requires finding the value of the variables involved

that satisfy all equations.

     Let’s look at the following system – it is a pair of equations that are straight lines so we call it a Linear System of Equations.   All of the systems that we will study in A30 will be linear.

     

 

Our goal is find out whether or not these two lines cross, and if they do, at what point (ordered pair) do they touch? There are at least three ways to do this and the first one is by graphing the lines.

Remember from Math 10 – all oblique lines (not horizontal or vertical) have equations that can be written in the form y = mx + b where m = slope of the line and b = y-intercept.

Let’s try to find the solution by graphing.

 First, solve for y in each equation.

 

  

 Second, pick out the slope and the y-intercept for each line.

 m = m =

 b = b =

 Third, using a piece of graph paper and a **ruler,**  carefully draw the lines by plotting the y-intercept first (where the graph touches the y-axis) and then finding a second point by using the slope (remember slope = rise over run).

Let’s try it again: 

 

**Part Two – Classifying Systems of Linear Equations**

Graph each of these systems on a separate graph:

2x + y = 5 3x – y = 2 2x + y = 3

y = 3 2y = 6x – 4 2x + y = 6



So, there are really three different possible situations with a pair of linear equations. They might cross at one location (happens most of the time), they might not touch at all (parallel) or they might completely overlap and touch in infinite points. We have names for each of these situations to classify them.

INCONSISTENT – means that the lines do not touch and therefore, there is no solution. The lines must be parallel.

CONSISTENT-INDEPENDENT – means that the lines touch at one distinct point so the system has one solution.

CONSISTENT-DEPENDENT - means that the lines completely overlap and so there are infinite solutions.

Is it possible to tell which situation it is without having to draw the graphs? Of course!!

 If you solve each equation for y and then examine their slope and y-intercept you should be able to tell what type of system you have.

3x – y = 5 3x + 2y = 5 3x + 5y = 10

3y = 9x + 6 x + y = 4 6x + 10y = 20