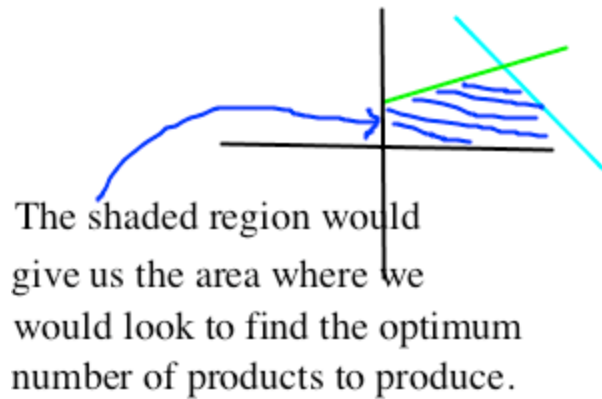


Solving Systems of Linear Equations

This is important for problems in business and problems in physics and problems in navigation...and more.



In some business applications, we graph some lines to represent our "constraints:" we cannot produce more than a certain number of products in a day; our profit is limited; our expenses are limited. The graphs of these things would be inequalities.

To solve this problem, we need to be able to graph lines, and to find their point of intersection -- i.e., we need to know how to solve systems of linear equations!!!

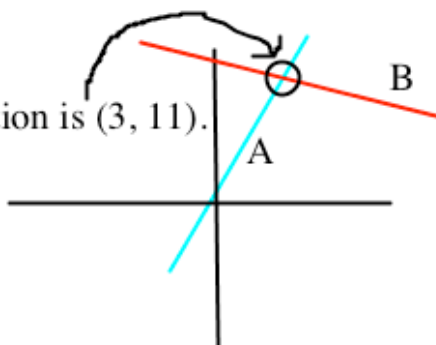
Other applications involve more complicated curves...which we are not ready for. We have to start with lines and build our way up to the more complex curves and the more complex methods of finding intersections.

Examples of Solving by Graphing

Find the intersection, if any, of $y = 3x + 2$ and $y = -x + 14$.

The lines intersect!!

The point of intersection is $(3, 11)$.



The first line (A) has a y-intercept of $(0, 2)$ and slope of $3/1$. We use the fact that our equation is in slope-intercept for $y = mx + b$, where m is the slope of the line and b is the y-intercept. The second line (B) has a y-int of $(0, 14)$ and a slope of $-1/1$.

Check to see if $(3, 11)$ is the correct solution!!

A) $11 = 3(3) + 2 = 11$ ✓ B) $11 = -(3) + 14 = -3 + 14 = 11$ ✓

Find the intersection, if any, of $3x + 4y = 10$ and $5x = 18 - 8y$.

This time, our equations are not in slope-intercept form!! So, we can make "t-tables" for each equation, plot the points we get, and use the points to graph our lines.

$$3x + 4y = 10$$

x	y
-3	19/4
-2	4
0	10/4
1	7/4

$$3(1) + 4y = 10$$

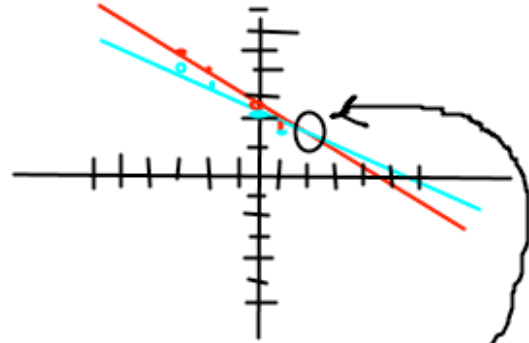
$$\begin{aligned} -3 & & -3 \\ 4y & = & 7 \\ y & = & 7/4 \end{aligned}$$

$$5x = 18 - 8y$$

x	y
-3	33/8
-2	28/8
0	18/8
1	13/8

$$5(-3) = 18 - 8y$$

$$\begin{aligned} -15 & = & 18 - 8y \\ -18 & & -18 \\ -33 & = & -8y \\ y & = & 33/8 \end{aligned}$$



They intersect!!

The point of intersection is (2, 1).

Check solution by making sure that (2, 1) works in both equations!!

$$3(2) + 4(1) = 6 + 4 = 10 \checkmark$$

$$5(2) = 10 \text{ but } 18 - 8(1) = 18 - 8 = 10 \text{ also! } \checkmark$$