SYSTEMS OF EQUATIONS: GRAPHING

Consider the system of two equations in two variables:

$$\begin{aligned} x + y &= 7 \\ -2x + y &= 1 \end{aligned}$$

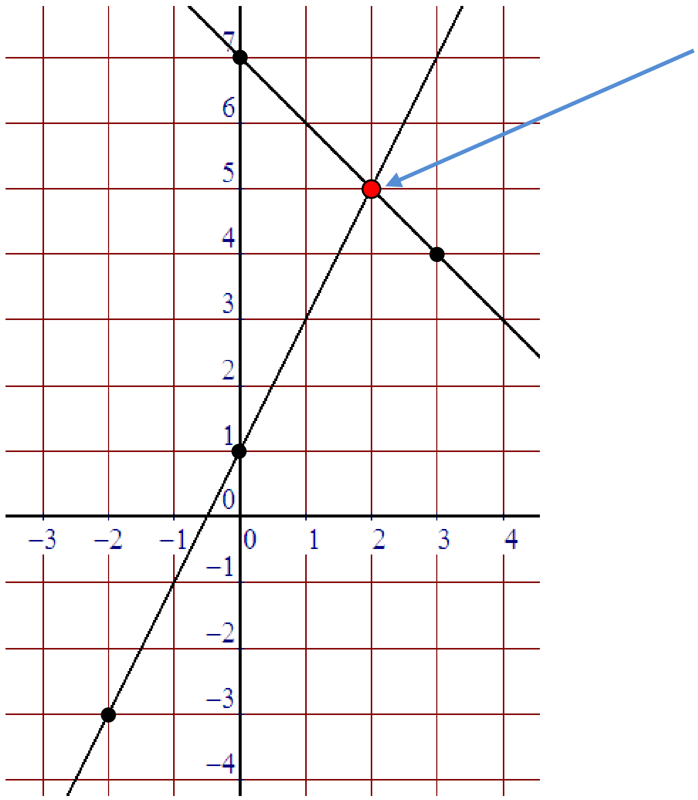
Now that we know how to graph straight lines, we're going to learn a method to solve a system of two equations in two variables. Each equation in the system above is a line; assuming the lines intersect (and assuming they're not the same line), there will be one point of intersection. Since that point of intersection lies on both lines (is that clear?), the coordinates (the x and y) of that point must satisfy both of the equations. Does that make any sense?

EXAMPLE 3: **Solve the system of equations by graphing.** $$\begin{aligned} \boldsymbol{x + y} &= \mathbf{7} \\ \boldsymbol{-2x + y} &= \mathbf{1} \end{aligned}$$

Solution: Each equation is a line, so let's graph each of them and then turn our attention to their point of intersection.

Line #1: Solve for y to get $y = -x + 7$. If we let $x = 3$, then $y = 4$, and so **(3, 4)** is on the line. If we choose $x = 0$, then $y = 7$, in which case **(0, 7)** is on the line. We'll use these two points for Line #1.

Line #2: Solve for y to get $y = 2x + 1$. If $x = 0$, then $y = 1$, and if $x = -2$, then $y = -3$. So we'll use the points **(0, 1)** and **(–2, –3)** for Line #2.



The point of intersection of the two lines appears to be the point (2, 5). This means that the solution of the given system of equations is

$$x = 2, y = 5$$

Important Note: Since we're reading points on a graph, it's very easy to misread them (imagine if the *x*- and *y*-coordinates were fractions). Thus, the graphing method is only an *approximation*, but it's a great method when algebraic methods – for instance, Elimination and Substitution – fail to work.