MPM 2D
Mr. Kempe

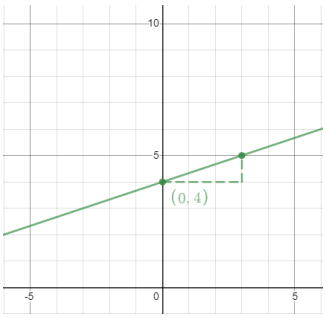
Class Notes
Unit 2, Lesson 3

Solving Linear Systems – by Graphing

Definition: A **linear system** is when two (or more) lines are considered at the same time. In this course, when solving a system, we will only consider two lines at a time.

To **solve** a linear system means to find all points that satisfy **both** equations – that is, where the lines cross.

Example 1: Graph the linear system $y=\frac{1}{3}x+4$, $5x+3y=30$ and state its solution.



The first line is in **slope-y-intercept** form.
The y-intercept is 2 so we start at the point (0, 2).
The slope is 1/3, so from the y-intercept we go right 3 and up 1 to our next point.

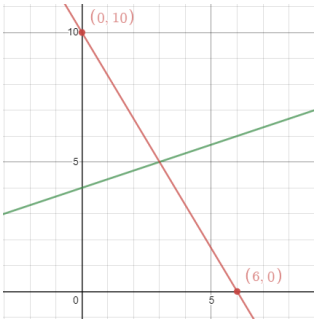
The next line is in standard form, so either we need to change forms, or we can use the **intercepts** method to find points:

To find the x-intercept, sub y=0, solve for x:

$5x+3(0)=30$
$5x=30$
$x=6$

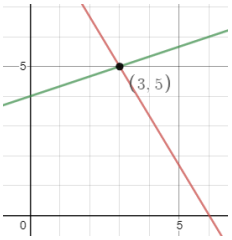
To find the y-intercept, sub x=0, solve for y:

$5(0)+3y=30$
$3y=30$
$y=10$



We plot our two points and connect the dots!

Now that we've graphed both lines, it's time to state the solution.
The point of intersection is (3, 5), so the solution is (3,5) [or x=3, y =5].



We can check our solution by substituting into the original equations and seeing if the points work.

$y=\frac{1}{3}x+4$
$(5)=\frac{1}{3}(3)+4$
$5=1+4$
$5=5$

$5x+3y=30$
$5(3)+3(5)=30$
$15+15=30$
$30=30$

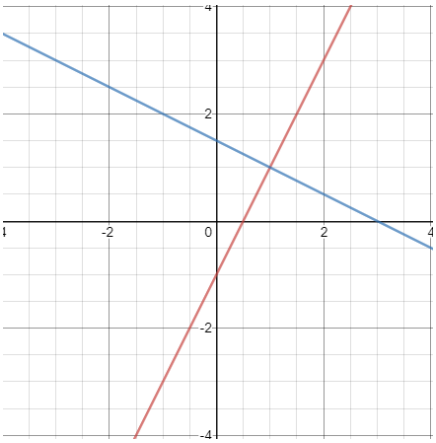
Both check out!

MPM 2D
Mr. Kempe

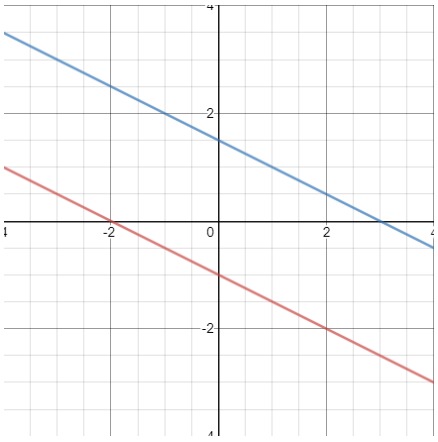
Class Notes
Unit 2, Lesson 3

Types of Solutions

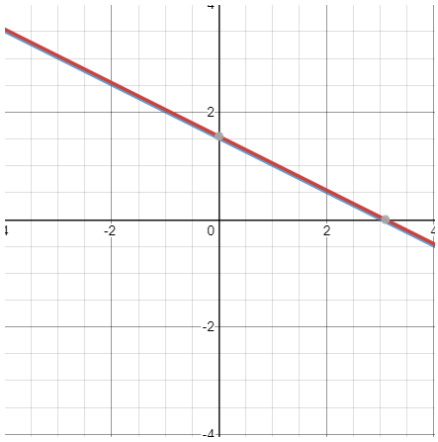
There are three ways a pair of lines can intersect:



One Solution
(lines cross)



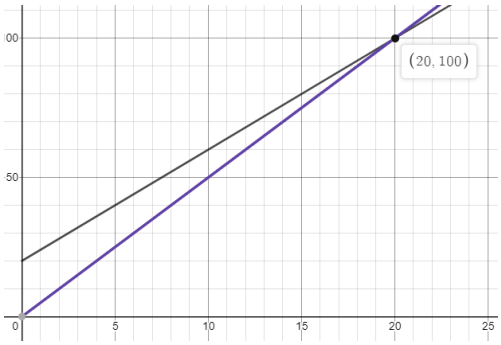
No Solution
(parallel, do not cross)



Infinite Solutions
(same line twice)

Example 2: Andrew and Reegan are racing each other. Since Reegan is faster, she decides to give Andrew a head start of 20m. If Andrew runs at 4m/s and Reegan runs at 5m/s, how long will it take Reegan to catch up to Andrew?

Let *d* be the distance from Reegan's start position (in meters) and *t* be the time (in seconds) since they started racing.



Reegan's Equation: d = 5t
Andrew's Equation: d = 4t + 20

We graph the two equations and see where they cross.

The intersection point is (20, 100) which means after 20 seconds, both Reegan and Andrew have reached the 100m mark.

Therefore it takes **20 seconds** for Reegan to catch up to Andrew.

Practice: pg. 26 #1ac, 2, 4, 5ac (graph by hand), 6, 8, 9, 19*