MAT 1275 C01/0227 –

Class #4 (Thurs 9 Sept. 2)

Today: "2×2" systems of linear equations

Example (from Graphing Lines – #8)

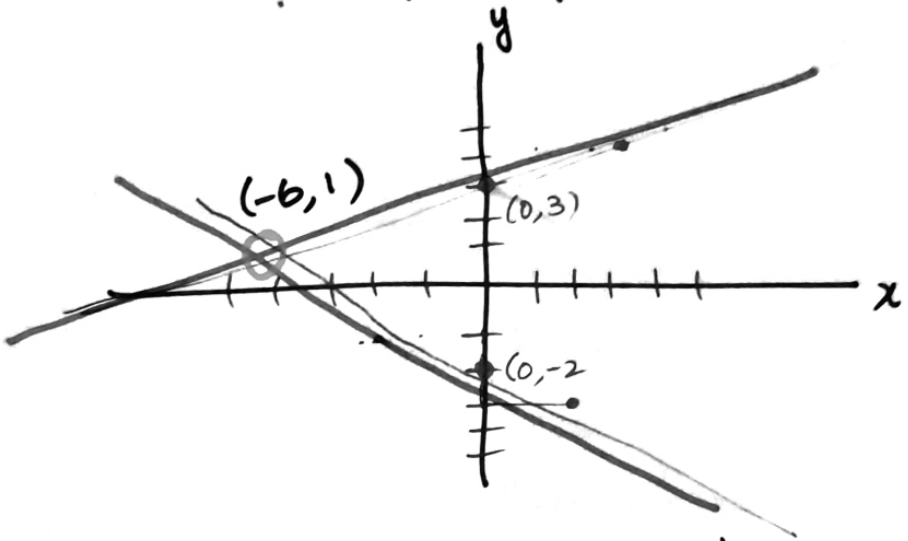
$$y = -\frac{1}{2}x - 2$$

$$y = \frac{1}{3}x + 3$$

} in WebWork, you are asked to graph these 2 lines, and find where they intersect

→ Point (x_0, y_0) where the lines intersect is the "solution of the linear system"

Let's sketch the graphs of these 2 lines by hand:



$y = -\frac{1}{2}x - 2$

$y = \frac{1}{3}x + 3$

We have solved this linear system graphically:
the 2 lines intersect at the point $(-6, 1)$...
meaning $x = -6$ and $y = 1$ "satisfy both equations"

Let's verify that $(x, y) = (-6, 1)$
satisfies both linear equations...

Check : $(-6, 1)$ satisfies the given 2×2 linear system :

$$y = -\frac{1}{2}x - 2 \quad (1)$$

$$y = \frac{1}{3}x + 3 \quad (2)$$

(1): Plug in $x = -6$, $y = 1$ into eqn. (1):

$$1 \stackrel{?}{=} -\frac{1}{2}(-6) - 2$$

$$1 \stackrel{?}{=} 3 - 2$$

$$1 = 1 \checkmark$$

verifying that $(-6, 1)$ is on the $y = -\frac{1}{2}x - 2$

(2) $$1 \stackrel{?}{=} \frac{1}{3}(-6) + 3$$

$$1 \stackrel{?}{=} -2 + 3$$

$$1 = 1 \checkmark$$

verify that $(-6, 1)$ is on the line $y = \frac{1}{3}x + 3$

Example (WebWork, Linear Systems #1 – but let's solve the system algebraically)

Given 2x2 linear system:

$$3x - y = 4 \quad (1) \leftarrow$$
$$2x - 3y = -9 \quad (2)$$

We will use the "substitution method" (read OpenStax §4.1 !")

(a) Take one of the equations, and solve for one variable in terms of the other (ie, isolate 1 of the variables)

Eqn (1) – we can easily isolate y!

$$3x = 4 + y$$
$$y = 3x - 4$$

So let's rewrite the linear system:

$$y = 3x - 4$$
$$2x - 3y = -9$$

} substitute $y = 3x - 4$ for y in the 2nd eqn

$$2x - 3[3x - 4] = -9$$

} solve for x!

We have transformed 2 equations in 2 variables to a single equation in a single variable!

$$2x - 9x + 12 = -9$$
$$-7x = -9 - 12$$
$$-7x = -21$$
$$x = \frac{-21}{-7} = 3$$

} so solution is $(3, 5)$ (x-coord of solution!)

To get y-coord: plug $x = 3$ into $y = 3x - 4$: $y = 3(3) - 4 = 5$