MAT1275CO/0L27 - Class #6

Fri, Sept. 10

Agenda

- 1 more 2x2 linear system
  - "elimination/addition" method.
  - look at an application.
- 3x3 linear systems. - §4.4

Parallel lines ≠ "coincident" lines

"inconsistent 2×2 linear system" (w/ no solutions!)

"dependent" 2×2 linear system (w/ infinitely many solutions)

Examples :

$$y = 2x + 3$$
$$6x - 3y = -9$$

Exercise: Graph these in Desmos!

let's try to solve this system algebraically :

$$6x - 3[2x + 3] = -9$$

$$6x - 6x - 9 = -9 \rightarrow 0 = 0$$

What did we just do in the chat?

Given the 2×2 linear system

$$y = 2x + 3$$

$$6x - 3y = -9$$

put this in slope-int form:

$$\frac{-3y}{-3} = \frac{-6x}{-3} - \frac{9}{-3}$$ (subtract 6x) (divide thru by −3)

$$y = 2x + 3$$

This is another way of seeing (algebraically) that the 2 given linear equations are equivalent

OTOH :

$$y = 2x + 3$$
$$6x - 3y = -8$$

} same slope but diff y-int ! **parallel**

→ meaning : the 2×2 linear system is "inconsistent", i.e., no solutions !

Elimination Method : [§ 4.1, Example 4.9]

WebWork : Linear Systems, #4

$$2x - 6y = 24 \quad (1)$$
$$+\quad 2x + 6y = -12 \quad (2)$$

$$2x + 2x = 24 - 12$$

$$4x = 12$$

$$\boxed{x = 3}$$

$(2x - 6y) + (2x + 6y) = 24 - 12$

$\Rightarrow 2x + 2x = 12$

$4x = 12$

Plug $x = 3$ into eqn (1) :

$$2(3) - 6y = 24$$
$$-6y = 18 \Rightarrow \boxed{y = -3}$$

or use Eqn (2) !

$2(3) + 6y = -12$

$6 + 6y = -12$

$6y = -18$

$y = \frac{-18}{6} = -3$

3×3 Systems (finally!)

Z

By example: Linear Systems #1

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$$4x - 5y + 2z = 46 \quad (1)$$
$$-y + z = 7 \quad (2) \leftarrow$$
$$-2z = -6 \quad (3)$$
$$\frac{-2z}{-2} = \frac{-6}{-2}$$

1st step

Solve for z:

$$\boxed{z = 3}$$

2nd step: Plug in z = 3 into eqn (2) so that we can solve for y!

$$-y + 3 = 7 \quad [(2) \text{ w/ } z = 3]$$
$$\boxed{y = -4}$$

Plug in $y = -4$ and $z = 3$ into (1):

$$4x - 5(-4) + 2(3) = 46$$

$$4x + 20 + 6 = 46$$

$$4x = 46 - 6 - 20$$

$$4x = 20$$

$$\boxed{x = 5}$$

So solution is $\boxed{(5, -4, 3)}$