Fall 2021 Precalc Lesson 2.4

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Do Now

Be sure to…Get out your notebook/binder. Read the paragraph below carefully, then answer the questions below. Show all work and check your results!

1. Solve for x and y, using any method you choose.
2. What does row-echelon form mean?
3. Describe the steps for solving this system using Gaussian elimination.

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

1. This is a system of linear eqs written in row echelon form.
2. y =

B24 rules

Welcome to our new room, B24! Please read the information below:

1. When you come in, please find a seat at a desk (if one's available) or one of the six closest desks to the screen. ***Do not sit in the back of the classroom***. We'll conduct the do now and mini lesson from here.
2. When I dismiss you for independent work, find a sit at one of the computer workstations.
3. ***No food or drink by the computers.***
4. At the end of the period, you'll be directed to assemble for the exit ticket/debrief. Log out of your computer, and ***quietly*** return to a seat near the front.

framing

- **what:** use Gaussian elimination to solve multivariate systems of equations
- **why:** Gaussian elimination is a powerful method for solving systems of equations. It's what computers use.
- **where to:** representing systems of equations as matrices

Row-echelon form (review)

To solve systems with more than two variables, we want to transform the system into **row-echelon form:**

System of Three Linear Equations in Three Variables

$$\begin{cases} x - 2y + 3z = 9 \\ -x + 3y + z = -2 \\ 2x - 5y + 5z = 17 \end{cases}$$

Equivalent System in Row-Echelon Form

$$\begin{cases} x - 2y + 3z = 9 \\ y + 4z = 7 \\ z = 2 \end{cases}$$

A system is in row-echelon form if it has a stair-step pattern and each equation has a leading coefficient of 1.

Row operations (review)

Gaussian elimination involves three **row operations**:

1. Exchange equations
2. Multiply one of the equations but some number (but not zero)
3. Add one equation to a multiple of another equation

Johann Gauss, the guy who came up with this algorithm

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Warm up

Let's solve this system using Gaussian elimination
Be sure to follow along in your notes. Try to stay one step ahead!

$$\begin{cases} 3x - y + z = 1 \\ 2x - 3z = -14 \\ 5y + 2z = 8 \end{cases}$$

class: precalc **goal:** HDW use Gaussian elimination to solve multivariate systems of equations?

Row exchange for 1 and 2.

Ask if student wants to lead the class.

see handwritten notes for solution.

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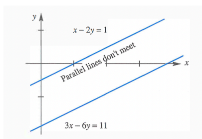
mini-lesson

Use Gaussian elimination to solve the two systems below. Be sure to work on your own showing all work. Be prepared to share out.

a. $x - 2y = 1$
$3x - 6y = 11$

b. $x - 2y = 1$
$3x - 6y = 3$



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see pg. 490 of textbook for solution.

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mini-lesson

With a partner, try to solve this systems using Gaussian elimination:

Row operations

1. Exchange equations
2. Multiply one of the equations but some number (but not zero)
3. Add one equation to a multiple of another equation

$$\begin{cases} 3x - 2y + 4z = 1 \\ x + y - 2z = 3 \\ 2x - 3y + 6z = 8 \end{cases}$$

class: precalc **goal:** HDW use Gaussian elimination to solve multivariate systems of equations?

Independent work

1. Use elimination and back substitution to solve the systems below:

a.
$$\begin{cases} 3x - 3y + 6z = 6 \\ x + 2y - z = 5 \\ 5x - 8y + 13z = 7 \end{cases}$$

b.
$$\begin{cases} x - 3y + z = 1 \\ 2x - y - 2z = 2 \\ x + 2y - 3z = -1 \end{cases}$$

c.
$$\begin{cases} x + y - 3z = -1 \\ y - z = 0 \\ -x + 2y = 1 \end{cases}$$

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Reflection

- How is elimination different from substitution?
- Why is it useful to reduce systems of equations to row-echelon form?

possible exit tickets

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wrapping up!

be sure to: read the directions below!

1. Make sure there isn't any litter near your workstation.
2. If you borrowed headphones, sign them back in.
3. **Make sure you are logged out of your computer!**
4. Remain in your seat until the bell rings.

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