Announcements: August 28

- Office Hours today 1-2, Skiles 234
- Bharat's Office Hours Tue 1:45-2:45, Skiles 230
- WebWorK due date pushed back to Friday (only this week)
- Quiz in recitation on Friday (covers material up to today's class)
- Join our Piazza group: 1553 E1 through E5

Section 1.1

Systems of Linear Equations

Poll

Is it possible for a system of linear equations to have exactly two solutions?

Systems of Linear Equations

The solution to a single linear equation can be...

The solution to **system** of linear equations is...

For example, consider this system.

$$\begin{aligned} x - 3y &= -3 \\ 2x + y &= 8 \end{aligned}$$

Example

Solve:

$$
\begin{aligned}
x + 2y + 3z &= 6 \\
2x - 3y + 2z &= 14 \\
3x + y - z &= -2
\end{aligned}
$$

How many ways can you do it?

Example

Solve:

$$
\begin{aligned}
x + 2y + 3z &= 6 \\
2x - 3y + 2z &= 14 \\
3x + y - z &= -2
\end{aligned}
$$

It is redundant to write x, y, z again and again, so we rewrite using (augmented) *matrices*:

Row operations

Our manipulations of matrices are called row operations.

Which operations did we use?

We call these: row swap, row scale, and row replacement

Goal: we want our elimination method to eventually produce a system of equations like

$$\begin{aligned} x \qquad\qquad &= A \\ y \qquad &= B \\ z &= C \end{aligned}$$

or in matrix form:

Row operations

Why do row operations not change the solution?
Solve:

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

System has one solution, $x = 1, y = 1$.

What happens to the two lines as you do row operations?

$$\left(\begin{array}{cc|c} 1 & 1 & 2 \\ -2 & 1 & -1 \end{array}\right)$$

A New Kind of Example

Solve:

$$\begin{aligned} x + y &= 2 \\ 3x + 4y &= 5 \\ 4x + 5y &= 9 \end{aligned}$$

$$\left(\begin{array}{cc|c} 1 & 1 & 2 \\ 3 & 4 & 5 \\ 4 & 5 & 9 \end{array}\right)$$

We say the system is...