

Math 2130
Linear Algebra
Week 1
Gauss's method

Charlotte Aten

2025 August 27

Today's topics

- 1 Gauss's method
- 2 Describing sets of points

Gauss's method

Solve the linear system

$$8x - 2y + z = 0,$$

$$y + z = 4,$$

and

$$z = 8.$$

This has exactly one solution, as we can see by repeatedly substituting.

Gauss's method

Solve the linear system

$$3x + 2y + z = 10,$$

$$x + y + z = 6,$$

and

$$x - z = 2.$$

This has no solutions because we get a false equation like $0 = 4$ when we put it into echelon form.

Gauss's method

Consider the linear system

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

and

$$12x + 9y = k.$$

For which values of k does this system have zero, one, or infinitely many solutions?

Describing the solution set

- Any consistent linear system's solution set has the form

$$\{ p + c_1\beta_1 + \cdots + c_k\beta_k \mid c_1, \dots, c_k \in \mathbb{R} \}$$

where p is any particular solution, k is the number of free variables that system has after Gaussian reduction, and the β_i are column vectors.