

# MATH 201: Linear Algebra

Tuesday, January 27, 2026

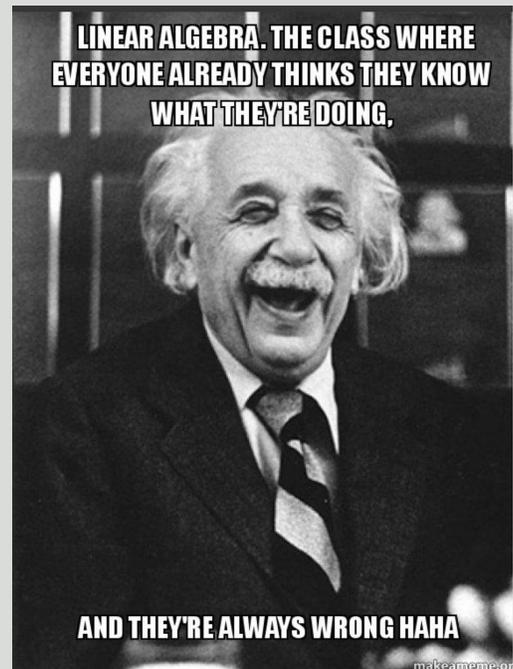
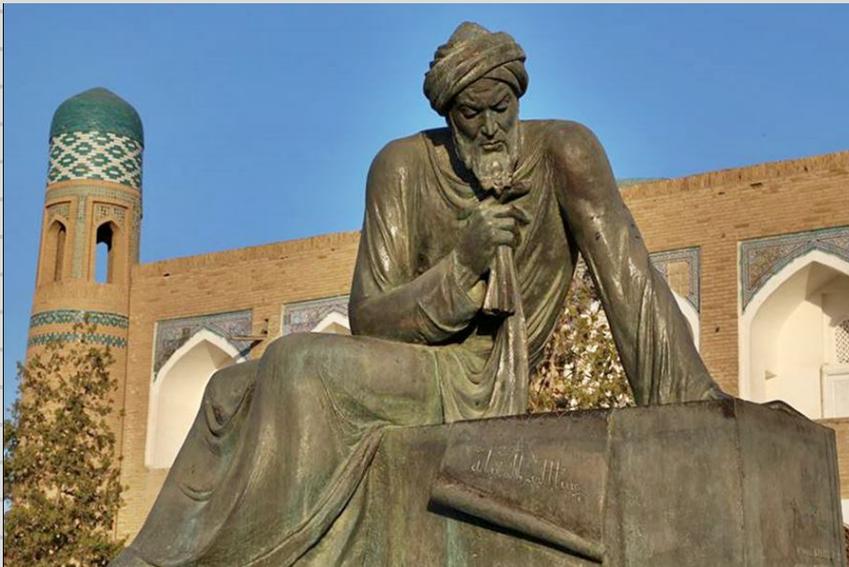
1. Introduction: What is Linear Algebra?
2. Overview of course / Logistics
3. Introduction to Linear Equations + Matrices
4. Achieving Reduced Row Echelon Form
5. Solving Systems of Linear Equations

Seminar : Friday 2-4  
in math 205

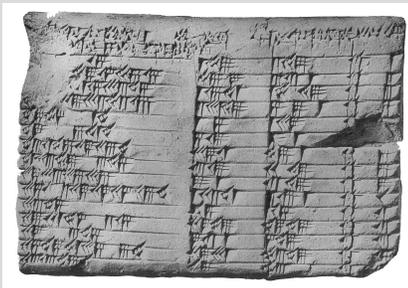
Office hours:

- Tuesday 3pm - 4pm
- Wednesday 9am-11am
- by appointment (email me)

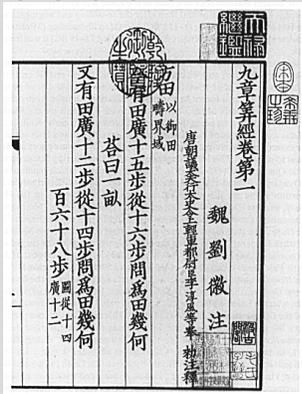
Al Kwarismi, the father of algebra



# What is Linear Algebra?



- Babylonian clay tablet (1800 BC) with Pythagorean triples



- "Nine Chapters on the Mathematical Art" (250 BC) describing how to solve systems of linear equations.



- "The Concise Book of Calculation by Restoration and Balancing" (820 AD) by Al-Khwarizmi.

This is where we get the word "الجبر" which means "restoration"



- Linen fragment from Bird's cave in Armenia. (~3500 BC). The words "line" and "linear" are derived from the ancient word "linen".

- Linear Algebra is the study of linear equations and their representations in vector spaces via matrices
- It is a foundational subject which plays a crucial role in nearly every field of science, engineering, and economics.

# Modern Applications

## Economics

- Input - Output Models
- Market Equilibrium
- Portfolio Optimization

## Computer Science

- Graphics
- Machine Learning
- Google's pagerank algorithm

## Applied Math

- Diff. Equations
- Numerical Analysis
- Optimization

## Cybersecurity

- Cryptographic Algorithms
- Error detection/correction
- Network Security

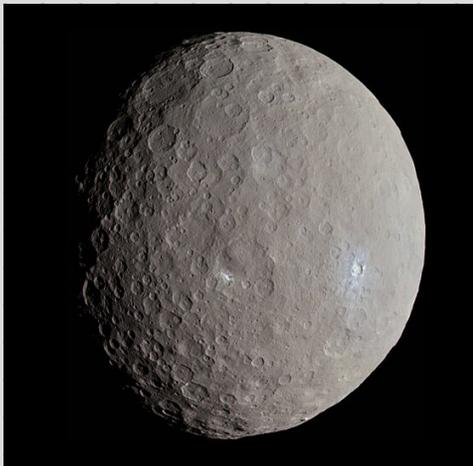
## Chemical Engineering

- Stoichiometry
- Simulation & Modeling
- Molecular Orbitals

## Pedagogy

- Educational data analysis
- Learning analytics
- Recommendation systems

# Ceres



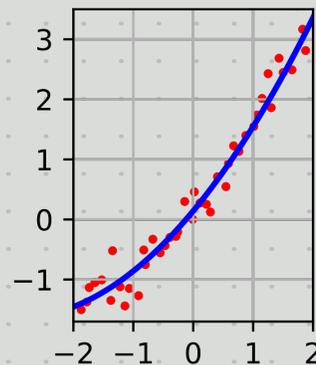
Giuseppe Piazzi



Carl Friedrich Gauss



The method of least squares.



# Overview and Logistics

## Content:

- linear equations
- linear transformations
- subspaces of  $\mathbb{R}^n$  & their dimensions
- linear spaces
- orthogonality & least squares method.
- determinants
- eigenvalues & eigenvectors

## Textbooks:

- Linear Algebra with Applications by Otto Bretscher
- Linear Algebra: A modern introduction by David Poole

## Class Expectations

1. "Required reading" should be completed before lecture
2. Attendance is mandatory and will affect your grade.
3. Each student must have a dedicated notebook for lectures and tutorials.

\* I will periodically check that you have been taking notes!

4. You are expected to participate actively during lectures. No phones!
5. More details can be found in the syllabus.

## Grading

- Quizzes / Participation: 20%
- Midterm Exam: 40%
- Final Exam: 40%

\* There will be no graded homework!

<https://t.me/+bjAAx7KWEnYxNGEx>

In this lecture, we also covered:

- examples of solving linear systems
- reduced row echelon form
- elementary row operations

This is the contents of sections 1.1 and 1.2 in Bretscher 4th edition.