

Math 2250 (Section 13)

Differential Equations & Linear Algebra

Instructor: Dr. Daniel Hernández (JWB 118)

University of Utah

August 27, 2013

Who am I?

Who am I?



My mathematical journey

My mathematical journey



My mathematical journey



My mathematical journey



My mathematical journey



My mathematical journey



My research is in
commutative algebra and **algebraic geometry**.

<http://www.math.utah.edu/~dhernan/math2250.html>

<http://www.math.utah.edu/~dhernan/math2250.html>

- Read the syllabus carefully.

<http://www.math.utah.edu/~dhernan/math2250.html>

- ▶ Read the syllabus carefully.
- ▶ Read **Math 2250 Update** every lecture.

<http://www.math.utah.edu/~dhernan/math2250.html>

- ▶ Read the syllabus carefully.
- ▶ Read **Math 2250 Update** every lecture.
- ▶ Check assignments.

<http://www.math.utah.edu/~dhernan/math2250.html>

- ▶ Read the syllabus carefully.
- ▶ Read **Math 2250 Update** every lecture.
- ▶ Check assignments.
- ▶ We'll also use CANVAS (mostly for grades/deadlines).

Homework: Introduction

- ▶ Log into, and familiarize yourself with, CANVAS.
- ▶ Introduce yourself via CANVAS message.

Evaluation

Evaluation

- ▶ Homework (10%): Assigned every lecture.
 - ▶ Due on Thursdays (usually); see CANVAS calendar.
 - ▶ Only a few problems graded (by grader).
 - ▶ Two lowest grades will be dropped.
 - ▶ No late homework will be accepted.

Evaluation

- ▶ Homework (10%): Assigned every lecture.
 - ▶ Due on Thursdays (usually); see CANVAS calendar.
 - ▶ Only a few problems graded (by grader).
 - ▶ Two lowest grades will be dropped.
 - ▶ No late homework will be accepted.
- ▶ Quizzes (10%)
 - ▶ Normal Quiz (5%): about 10 minutes, most Thursdays.
 - ▶ Super Quiz (5%): longer, 2 weeks before an exam.

Evaluation

- ▶ Homework (10%): Assigned every lecture.
 - ▶ Due on Thursdays (usually); see CANVAS calendar.
 - ▶ Only a few problems graded (by grader).
 - ▶ Two lowest grades will be dropped.
 - ▶ No late homework will be accepted.
- ▶ Quizzes (10%)
 - ▶ Normal Quiz (5%): about 10 minutes, most Thursdays.
 - ▶ Super Quiz (5%): longer, 2 weeks before an exam.
- ▶ Midterms (30%): Two 55-minute exams (15% each)
- ▶ Final (30%): Two hours, comprehensive.

Evaluation

- ▶ Homework (10%): Assigned every lecture.
 - ▶ Due on Thursdays (usually); see CANVAS calendar.
 - ▶ Only a few problems graded (by grader).
 - ▶ Two lowest grades will be dropped.
 - ▶ No late homework will be accepted.
- ▶ Quizzes (10%)
 - ▶ Normal Quiz (5%): about 10 minutes, most Thursdays.
 - ▶ Super Quiz (5%): longer, 2 weeks before an exam.
- ▶ Midterms (30%): Two 55-minute exams (15% each)
- ▶ Final (30%): Two hours, comprehensive.
- ▶ Lab (20%)

Labs (a recent innovation)

- ▶ Every Wednesday (Sections 14 & 15).

Labs (a recent innovation)

- ▶ Every Wednesday (Sections 14 & 15).
- ▶ Emphasis on

Labs (a recent innovation)

- ▶ Every Wednesday (Sections 14 & 15).
- ▶ Emphasis on
 - ▶ in-depth (longer), interesting problems.

Labs (a recent innovation)

- ▶ Every Wednesday (Sections 14 & 15).
- ▶ Emphasis on
 - ▶ in-depth (longer), interesting problems.
 - ▶ group work, both among yourselves and with your TA.

Labs (a recent innovation)

- ▶ Every Wednesday (Sections 14 & 15).
- ▶ Emphasis on
 - ▶ in-depth (longer), interesting problems.
 - ▶ group work, both among yourselves and with your TA.
- ▶ Grading criteria

Labs (a recent innovation)

- ▶ Every Wednesday (Sections 14 & 15).
- ▶ Emphasis on
 - ▶ in-depth (longer), interesting problems.
 - ▶ group work, both among yourselves and with your TA.
- ▶ Grading criteria
 - ▶ Mathematical correctness.

Labs (a recent innovation)

- ▶ Every Wednesday (Sections 14 & 15).
- ▶ Emphasis on
 - ▶ in-depth (longer), interesting problems.
 - ▶ group work, both among yourselves and with your TA.
- ▶ Grading criteria
 - ▶ Mathematical correctness.
 - ▶ Ability to clearly explain your rationale and motivation

Labs (a recent innovation)

- ▶ Every Wednesday (Sections 14 & 15).
- ▶ Emphasis on
 - ▶ in-depth (longer), interesting problems.
 - ▶ group work, both among yourselves and with your TA.
- ▶ Grading criteria
 - ▶ Mathematical correctness.
 - ▶ Ability to clearly explain your rationale and motivation
- ▶ TA will be available at COE for additional office hours.

Labs (a recent innovation)

- ▶ Every Wednesday (Sections 14 & 15).
- ▶ Emphasis on
 - ▶ in-depth (longer), interesting problems.
 - ▶ group work, both among yourselves and with your TA.
- ▶ Grading criteria
 - ▶ Mathematical correctness.
 - ▶ Ability to clearly explain your rationale and motivation
- ▶ TA will be available at COE for additional office hours.

Strategies for success

- ▶ Spend at least 10 hours a week outside of class.

Strategies for success

- ▶ Spend at least 10 hours a week outside of class.
- ▶ Attend class and lab regularly.

Strategies for success

- ▶ Spend at least 10 hours a week outside of class.
- ▶ Attend class and lab regularly.
- ▶ Read (e.g., text and Course Update) before each lecture.

Strategies for success

- ▶ Spend at least 10 hours a week outside of class.
- ▶ Attend class and lab regularly.
- ▶ Read (e.g., text and Course Update) before each lecture.
- ▶ Ask questions and become involved.

Strategies for success

- ▶ Spend at least 10 hours a week outside of class.
- ▶ Attend class and lab regularly.
- ▶ Read (e.g., text and Course Update) before each lecture.
- ▶ Ask questions and become involved.
- ▶ Do homework daily; start on the day material is covered in lecture (rather than waiting).

Strategies for success

- ▶ Spend at least 10 hours a week outside of class.
- ▶ Attend class and lab regularly.
- ▶ Read (e.g., text and Course Update) before each lecture.
- ▶ Ask questions and become involved.
- ▶ Do homework daily; start on the day material is covered in lecture (rather than waiting).
- ▶ Make friends and form study groups with your classmates.

Features unique to Section 13

- ▶ Issue: **LONG** lecture.

Features unique to Section 13

- ▶ Issue: **LONG** lecture.
- ▶ Remedy: Short break, extra motivated students?

Features unique to Section 13

- ▶ Issue: **LONG** lecture.
- ▶ Remedy: Short break, extra motivated students?
- ▶ Issue: Doesn't meet often.

Features unique to Section 13

- ▶ Issue: **LONG** lecture.
- ▶ Remedy: Short break, extra motivated students?
- ▶ Issue: Doesn't meet often.
- ▶ Remedy: Go to office hours (esp. TAs) and free tutoring.

Features unique to Section 13

- ▶ Issue: **LONG** lecture.
- ▶ Remedy: Short break, extra motivated students?
- ▶ Issue: Doesn't meet often.
- ▶ Remedy: Go to office hours (esp. TAs) and free tutoring.
- ▶ Issue: Awkward weekly schedule.

Features unique to Section 13

- ▶ Issue: **LONG** lecture.
- ▶ Remedy: Short break, extra motivated students?
- ▶ Issue: Doesn't meet often.
- ▶ Remedy: Go to office hours (esp. TAs) and free tutoring.
- ▶ Issue: Awkward weekly schedule.
- ▶ Remedy: Unique review period for exams.

Features unique to Section 13

- ▶ Issue: **LONG** lecture.
- ▶ Remedy: Short break, extra motivated students?
- ▶ Issue: Doesn't meet often.
- ▶ Remedy: Go to office hours (esp. TAs) and free tutoring.
- ▶ Issue: Awkward weekly schedule.
- ▶ Remedy: Unique review period for exams.
- ▶ Issue: Fast pace?

Features unique to Section 13

- ▶ Issue: **LONG** lecture.
- ▶ Remedy: Short break, extra motivated students?
- ▶ Issue: Doesn't meet often.
- ▶ Remedy: Go to office hours (esp. TAs) and free tutoring.
- ▶ Issue: Awkward weekly schedule.
- ▶ Remedy: Unique review period for exams.
- ▶ Issue: Fast pace?
- ▶ Remedy: Read ahead of time!

Features unique to Section 13

- ▶ Issue: **LONG** lecture.
- ▶ Remedy: Short break, extra motivated students?
- ▶ Issue: Doesn't meet often.
- ▶ Remedy: Go to office hours (esp. TAs) and free tutoring.
- ▶ Issue: Awkward weekly schedule.
- ▶ Remedy: Unique review period for exams.
- ▶ Issue: Fast pace?
- ▶ Remedy: Read ahead of time!

These words shouldn't mean much to you... yet

These words shouldn't mean much to you... yet

Differential Equations

These words shouldn't mean much to you... yet

Differential Equations

- ▶ More familiar

These words shouldn't mean much to you... yet

Differential Equations

- ▶ More familiar
- ▶ Modeling

These words shouldn't mean much to you... yet

Differential Equations

- ▶ More familiar
- ▶ Modeling
 - ▶ Dynamical systems
 - ▶ Mechanical systems

These words shouldn't mean much to you... yet

Differential Equations

- ▶ More familiar
- ▶ Modeling
 - ▶ Dynamical systems
 - ▶ Mechanical systems
- ▶ Systems of ODEs

These words shouldn't mean much to you... yet

Differential Equations

- ▶ More familiar
- ▶ Modeling
 - ▶ Dynamical systems
 - ▶ Mechanical systems
- ▶ Systems of ODEs
- ▶ Non-linear (!) equations

These words shouldn't mean much to you... yet

Differential Equations

- ▶ More familiar
- ▶ Modeling
 - ▶ Dynamical systems
 - ▶ Mechanical systems
- ▶ Systems of ODEs
- ▶ Non-linear (!) equations
- ▶ Laplace transforms

These words shouldn't mean much to you... yet

Differential Equations

- ▶ More familiar
- ▶ Modeling
 - ▶ Dynamical systems
 - ▶ Mechanical systems
- ▶ Systems of ODEs
- ▶ Non-linear (!) equations
- ▶ Laplace transforms
- ▶ Maple / Mathematica / Matlab

These words shouldn't mean much to you... yet

Differential Equations

- ▶ More familiar
- ▶ Modeling
 - ▶ Dynamical systems
 - ▶ Mechanical systems
- ▶ Systems of ODEs
- ▶ Non-linear (!) equations
- ▶ Laplace transforms
- ▶ Maple / Mathematica / Matlab

These words shouldn't mean much to you... yet

Differential Equations

Linear Algebra

- ▶ More familiar
- ▶ Modeling
 - ▶ Dynamical systems
 - ▶ Mechanical systems
- ▶ Systems of ODEs
- ▶ Non-linear (!) equations
- ▶ Laplace transforms
- ▶ Maple / Mathematica / Matlab

These words shouldn't mean much to you... yet

Differential Equations

Linear Algebra

- ▶ More familiar
 - ▶ Modeling
 - ▶ Dynamical systems
 - ▶ Mechanical systems
 - ▶ Systems of ODEs
 - ▶ Non-linear (!) equations
 - ▶ Laplace transforms
 - ▶ Maple / Mathematica / Matlab
- ▶ More abstract (initially)

These words shouldn't mean much to you... yet

Differential Equations

Linear Algebra

- ▶ More familiar
- ▶ Modeling
 - ▶ Dynamical systems
 - ▶ Mechanical systems
- ▶ Systems of ODEs
- ▶ Non-linear (!) equations
- ▶ Laplace transforms
- ▶ Maple / Mathematica / Matlab

- ▶ More abstract (initially)
- ▶ Matrix algebra

These words shouldn't mean much to you... yet

Differential Equations

- ▶ More familiar
- ▶ Modeling
 - ▶ Dynamical systems
 - ▶ Mechanical systems
- ▶ Systems of ODEs
- ▶ Non-linear (!) equations
- ▶ Laplace transforms
- ▶ Maple / Mathematica / Matlab

Linear Algebra

- ▶ More abstract (initially)
- ▶ Matrix algebra
 - ▶ Multiplication
 - ▶ Row/Column operations
- ▶ Determinants / Inverses

These words shouldn't mean much to you... yet

Differential Equations

- ▶ More familiar
- ▶ Modeling
 - ▶ Dynamical systems
 - ▶ Mechanical systems
- ▶ Systems of ODEs
- ▶ Non-linear (!) equations
- ▶ Laplace transforms
- ▶ Maple / Mathematica / Matlab

Linear Algebra

- ▶ More abstract (initially)
- ▶ Matrix algebra
 - ▶ Multiplication
 - ▶ Row/Column operations
- ▶ Determinants / Inverses
- ▶ Vector spaces

These words shouldn't mean much to you... yet

Differential Equations

- ▶ More familiar
- ▶ Modeling
 - ▶ Dynamical systems
 - ▶ Mechanical systems
- ▶ Systems of ODEs
- ▶ Non-linear (!) equations
- ▶ Laplace transforms
- ▶ Maple / Mathematica / Matlab

Linear Algebra

- ▶ More abstract (initially)
- ▶ Matrix algebra
 - ▶ Multiplication
 - ▶ Row/Column operations
- ▶ Determinants / Inverses
- ▶ Vector spaces
- ▶ Eigen (vectors/values/spaces)

These words shouldn't mean much to you... yet

Differential Equations

- ▶ More familiar
- ▶ Modeling
 - ▶ Dynamical systems
 - ▶ Mechanical systems
- ▶ Systems of ODEs
- ▶ Non-linear (!) equations
- ▶ Laplace transforms
- ▶ Maple / Mathematica / Matlab

Linear Algebra

- ▶ More abstract (initially)
- ▶ Matrix algebra
 - ▶ Multiplication
 - ▶ Row/Column operations
- ▶ Determinants / Inverses
- ▶ Vector spaces
- ▶ Eigen (vectors/values/spaces)
- ▶ Maple / Mathematica / Matlab

These words shouldn't mean much to you... yet

Differential Equations

- ▶ More familiar
- ▶ Modeling
 - ▶ Dynamical systems
 - ▶ Mechanical systems
- ▶ Systems of ODEs
- ▶ Non-linear (!) equations
- ▶ Laplace transforms
- ▶ Maple / Mathematica / Matlab

Linear Algebra

- ▶ More abstract (initially)
- ▶ Matrix algebra
 - ▶ Multiplication
 - ▶ Row/Column operations
- ▶ Determinants / Inverses
- ▶ Vector spaces
- ▶ Eigen (vectors/values/spaces)
- ▶ Maple / Mathematica / Matlab

These words shouldn't mean much to you... yet

Differential Equations

Linear Algebra

- ▶ More familiar
 - ▶ Modeling
 - ▶ Dynamical systems
 - ▶ Mechanical systems
 - ▶ Systems of ODEs
 - ▶ Non-linear (!) equations
 - ▶ Laplace transforms
 - ▶ Maple / Mathematica / Matlab
- ▶ More abstract (initially)
 - ▶ Matrix algebra
 - ▶ Multiplication
 - ▶ Row/Column operations
 - ▶ Determinants / Inverses
 - ▶ Vector spaces
 - ▶ Eigen (vectors/values/spaces)
 - ▶ Maple / Mathematica / Matlab
- ▶ **Differential Equations:** We'll start today! ☺

These words shouldn't mean much to you... yet

Differential Equations

Linear Algebra

- ▶ More familiar
 - ▶ Modeling
 - ▶ Dynamical systems
 - ▶ Mechanical systems
 - ▶ Systems of ODEs
 - ▶ Non-linear (!) equations
 - ▶ Laplace transforms
 - ▶ Maple / Mathematica / Matlab
- ▶ More abstract (initially)
 - ▶ Matrix algebra
 - ▶ Multiplication
 - ▶ Row/Column operations
 - ▶ Determinants / Inverses
 - ▶ Vector spaces
 - ▶ Eigen (vectors/values/spaces)
 - ▶ Maple / Mathematica / Matlab
- ▶ **Differential Equations:** We'll start today! ☺
 - ▶ **Linear Algebra:** Unfortunately, not for a while.

These words shouldn't mean much to you... yet

Differential Equations

Linear Algebra

- ▶ More familiar
 - ▶ Modeling
 - ▶ Dynamical systems
 - ▶ Mechanical systems
 - ▶ Systems of ODEs
 - ▶ Non-linear (!) equations
 - ▶ Laplace transforms
 - ▶ Maple / Mathematica / Matlab
- ▶ More abstract (initially)
 - ▶ Matrix algebra
 - ▶ Multiplication
 - ▶ Row/Column operations
 - ▶ Determinants / Inverses
 - ▶ Vector spaces
 - ▶ Eigen (vectors/values/spaces)
 - ▶ Maple / Mathematica / Matlab
- ▶ **Differential Equations:** We'll start today! 😊
 - ▶ **Linear Algebra:** Unfortunately, not for a while. ☹