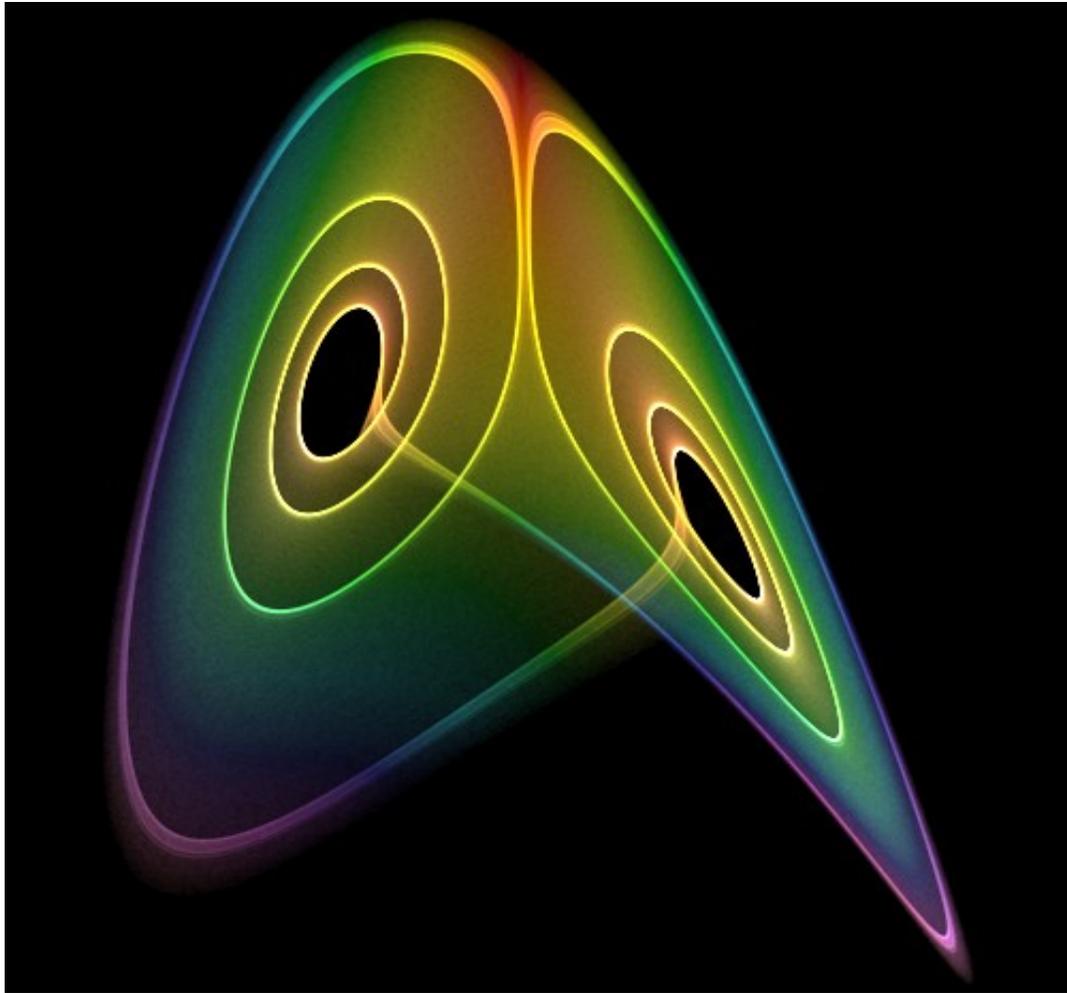


Math 2343: Ordinary Differential Equations



Summer 2018
SMU-in-Taos
Dr. Scott Norris

Basic Information

Course Description

An introduction to the study of differential equations in one independent variable: first- and second-order equations, plus systems of two first-order equations. Linear equations are studied using the methods of variation of parameters, undetermined coefficients, and Laplace transforms. Nonlinear equations are studied using the phase line, phase plane, and numerical integration.

Course Outcomes

1. Students can solve first-order separable and linear differential equations.
2. Students can solve second-order constant-coefficient linear ODEs using Undetermined Coefficients, Variation of Parameters, and Laplace Transforms.
3. Students can analyze simple spring-mass systems.

Course Textbook

Main Text: S.L. Campbell, R. Haberman. *Introduction to Differential Equations, with Dynamical Systems*. Princeton University Press, 2008.

Course Website

We will attempt to work entirely within our course website hosted on Piazza. All course announcements, homework materials, class notes and summaries, and supplementary material will be posted there. In addition, I would prefer to answer content- and policy-related questions via the forums, as it is more efficient than e-mail.

My Office Hours and Contact Info

Office Hours: afternoons or evenings, TBD
Office: TBD
Email: snorris@smu.edu
Phone: 214-768-4802

Group Work

Group work is encouraged on all homeworks!

Grading Policies

Distribution and Weights

Grades will be assigned based on a fixed scale, with 5 points per half-letter grade (96-100 A, 90-95 A-, 85-90 B+, 80-85 B, ... 65-70 C, 60-75 C-). Grades below 60/100 will receive a 'D' or 'F' at my discretion. Final scores will be determined using the following weights:

Component	Weight
Comprehensive Final Exam	40%
In-Class Test Questions (x3)	60%

Final Exam

The final exam will be comprehensive, and will occur at the very end of the August term. The best way to prepare for the final exam is to carefully review the solutions to each of your In-Class test questions, and identify exactly why you lost points on each problem. After this, try re-taking each question back-to-back, without the solutions.

Regular Exams

In light of the accelerated summer schedule, we will have a short exam at the beginning of each class, covering the previous day's material. This will replace the 2-3 full-length exams given during a regular semester.

The best way to prepare for the exams is to work carefully through the assigned homework problems, and identify any conceptual mistakes that you made. I am happy to help if you cannot identify where you went wrong.

Homework

In light of the accelerated summer schedule, homeworks will not be assessed as a component of your grade. Solutions will be posted to all homeworks in advance, and it is **your responsibility** to use the homework and solutions together as a learning tool (this is the European style). If you do not practice using the homework, you will not be ready for the in-class exams. Do **NOT** do the homework with the solutions in front of you, as this leads to false confidence. Instead, do the homework, and then compare your answers to the solutions.

Testing and Grading Philosophy

Please be advised that I give relatively difficult exams, for several reasons:

- **First**, it gives you an accurate taste of the challenges you will face in the “real world,” while still within the supportive cocoon of the university.
- **Second**, it gives you accurate feedback on your own skills – even if you score relatively well, you will see how you can improve if you so desire.
- **Third**, it makes it easy for me to identify hard work – if you do well, you can be proud, and I can write you a truly glowing recommendation letter!

Grading Process. I grade tests by problem rather than by exam (i.e., all problem 1s, then all problem 2s, etc.). This helps me to be consistent, and also means I don't know which exam belongs to which student. Problems are typically scored out of 6 points, with roughly the following rubric:

- 6 perfect, neat, easy to read
- 5 small error as described below
- 4 correct approach essentially followed; multiple or significant errors
- 3 deviation from correct approach, but many correct statements remains
- 2 serious deviation from correct approach, with some correct statements
- 1 only a small number of relevant, correct statements are present
- 0 no relevant correct statements made

I grade strictly! Most high school graduates have significant foundational weaknesses, and many teachers let this continue by assessing no penalty for “small” mistakes. This is a disservice to your future preparedness, and I will not perpetuate it. I will deduct a point for mistakes as small as:

- sloppy work that is hard to follow
- copying incorrectly between lines
- arithmetic or algebra mistakes
- failing to simplify your answer

Although you may not believe it, the purpose of difficult exams and strict grading is not to inflict misery – it is to encourage care and discipline. These policies are partially offset by the bonus opportunities and 15-point increment between grades described above. In addition, if scores are still too low, I am willing to curve the scores. In general, I aim for a median grade of around a B/B-, with at least 25-30% of the class receiving an A/A-.

Thoughts and Advice

What this class will be about

Differential Equations lies almost at the heart of applied mathematics. A huge collection of interesting problems from the real world are formulated in terms of differential equations. These equations are relationships between derivatives, and to solve them we must in principle do integrals. So Calculus gave us the tools we need to pose these problems, and many later classes will give us the tools needed to rigorously solve them. Here we will simply meet many of them for the first time, and also gain some basic tools with which to study them. As in Calculus, an overarching goal is to continue to refine our ability to think quantitatively - to make and assess the validity of quantitative arguments. Whatever your future field of study, this will be a valuable asset in a number-saturated world.

What you should have learned already

This class will depend **heavily** upon at least the following skills. Make sure you review them before class begins!

- Algebra: identify and avoid **all common algebra errors**
- Pre-Calc: perform correct exponential and logarithmic manipulation
- Calculus I: correctly calculate derivatives with product/chain rule
- Calculus II: correctly solve most reasonably difficult integrals
- Linear Algebra: Identify eigenvalues and vectors of a 2×2 matrix

Advice for Success: Maximize iterations

Another result of research on student learning is that retention is greatly enhanced by *multiple exposures to material*. This naturally suggests the use of an *iterative* approach to our material:

- Do the readings before every class, and contribute to the forum.
- Come to class prepared to ask at least one question. Ask it.
- Attempt every homework problem before office hours.
- Come to office hours with specific homework questions.
- Finish the homework after office hours.

If your past approach to math has been to avoid it until the night before the homework is due, I cannot urge you strongly enough to **re-read this section!**

University-wide Policies

Academic Dishonesty

"[T]he choice which could lead to scoundrelism will come, when it does come, in no very dramatic colors." – C.S. Lewis, *The Inner Ring*

Academic dishonesty is taken very seriously at SMU, and I take it very seriously as well, for different reasons – it represents the first, baby steps along a path that leads, eventually, to a life characterized by complete lack of integrity. Even the smallest forms of cheating in this class will be reported to the Honor Council, and carry a minimum penalty of a **full letter reduction** in your final grade. More severe instances will lead to automatically failing the course.

Disability Accommodations

Students needing academic accommodations for a disability must first contact Disability Accommodations & Success Strategies (DASS) at 214-768-1470 or www.smu.edu/alec/dass.asp to verify the disability and to establish eligibility for accommodations. They should then schedule an appointment with the professor to make appropriate arrangements. (See University Policy No. 2.4; an attachment describes the DASS procedures and relocated office.)

Religious Observance

Religiously observant students wishing to be absent on holidays that require missing class should notify their professors in writing at the beginning of the semester, and should discuss with them, in advance, acceptable ways of making up any work missed because of the absence. (See University Policy No. 1.9.)

Excused Absences for University Extracurricular Activities

Students participating in an officially sanctioned, scheduled University extracurricular activity should be given the opportunity to make up class assignments or other graded assignments missed as a result of their participation. It is the responsibility of the student to make arrangements with the instructor prior to any missed scheduled examination or other missed assignment for making up the work. (University Undergraduate Catalogue)