

Math 332: Applied Mathematics
Boyce & DiPrima, Chapters 5, 10, 11
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Trexler 270-G, 375-2358

2017

office hours 10M, 3T, 3W, 10Th

Course Objectives: *Continue to learn how to do mathematics!* Mathematics is a problem-solving discipline, and we all have room to improve. To develop as problem-solvers, we must focus on technique and not on memorization. The primary problem-solving skill in this course is the use of transformations to reduce a difficult problem into smaller, solvable components from which a full solution may be constructed. This skill is invaluable in technical industry, since very few problems come to us in a nice standard format. The material in this course can be very messy, but is basic to a wide variety of engineering applications. Applications we will look at include heat flow, wave propagation, music synthesis and digital photographic enhancement.

Intended Learning Outcomes: At the end of the course, successful students will be able to

- Apply techniques of differential equations to solve differential equations that are in some ways undefined
- Use separation of variables to transform partial differential equations into ordinary differential equations
- Find Fourier series of functions and use them to solve equations of interest
- Distinguish among various types of equations and their solutions, including the heat, wave, and Laplace's equation

Attendance Policy: Regular attendance is essential. The problems are intricate enough that you will want to hear the explanations and ask questions. Merely reproducing lecture notes will not work well. Also, it is vital that you spend enough time working outside of class that you can participate in class to make sure that class time is spent in a profitable way. You are responsible for everything done in class, through your attendance and sharing class notes with classmates.

Equipment: We will use Mathematica, a very powerful computer software package available on the college network.

Academic Integrity: The college policy is fully supported. Tests are closed notes, closed book.

Tests: Mastery-based testing on the topics on the following page. Test questions will be graded on a mastery/no mastery basis. You will have multiple chances to demonstrate mastery of a topic. Once you do so, you will not be further tested on that topic. So, if you do not achieve mastery of a topic on one test, new problems on that topic will be given on subsequent tests. My judgment of mastery will be based on you demonstrating that you fully understand the question; your arithmetic and algebra do not have to be perfect, but there should be no flaws in your approach to the problem. While this style of grading has the downside of no partial credit, the upsides include the ability to completely make up for early deficiencies. You always have the possibility of demonstrating mastery on 100% of the topics for the semester. The point is not to allow you to delay learning topics to the end of the course, but to encourage you to fully understand the early topics so that later topics can make sense. **The exam is Friday, April 28, 2:00-5:00.**

I expect you to spend at least 12 hours of work each week inside and outside of class.

Content Areas

1. Find a recurrence relation and several terms of solutions near an ordinary point.
2. Find a lower bound on the radius of convergence of series solutions.
3. Find the general solution of an Euler equation.
4. Find several terms of solutions near a regular singular point.
5. Analyze solutions of Bessel's equation.
6. Find and analyze the Fourier series of a function.
7. Find and analyze the cosine series or sine series of a function.
8. Find even and odd extensions of a function.
9. Find a steady state solution of a boundary value problem.
10. Find eigenvalues and eigenfunctions for a boundary value problem.
11. Use separation of variables to find solutions of a boundary value problem.
12. Find and analyze solutions of the heat equation.
13. Find and analyze solutions of the wave equation.
14. Find and analyze solutions of Laplace's equation on a circle.

Grading scale

- 13 or 14 = A
12 = A-
11 = B
10 = B-
9 = C
8 = C-
7 = D
6 = D-
5 or below = F

Study Problems

- p263 1-6 (parts a,b), 23-24
p269 3-8
p280 1-6,17-24
p286 1-8,14,16
p294 1-8
p305 1-4
p595 1-4,14-19
p605 13-16,19-20
p612 1-4
p620 7-10,15-18
p630 1-10
p639 1-6
p652 1-8 (parts a-c)
p666 5-8