MATH 2A

Differential Equations Spring 2026

Tuesday and Thursday 4pm-6:15pm in MLC 112

Instructor: Fatemeh Yarahmadi

E-mail: yarahmadifatemeh@fhda.edu

- The best way to contact me is through my email, yarahmadifatemeh@fhda.edu
- My office is located in S33N or S55 (PST Village)

Communication Plan

- Communication between instructor and student is very important. The best way to contact me is through Canvas and email. I will respond within 24 - 48 hours on weekdays, and on Monday for emails sent over the weekend. If I don't respond in that timeframe, please email me again.
- I always send out messages and announcements through Canvas. I would recommend checking your Canvas inbox daily, and if you can, download the Canvas app on your phone. I am very approachable so if you have any questions, please ask!

Course Description

Ordinary differential equations and selected applications.

Textbook & Required Materials:

Text: De Anza College: Introductory Differential Equations, ODE.

Graphing Calculator: TI-83/TI-83+/TI-84/TI-84+ (no calculator or any electric devices are allowed on the exam)

Computer/smartphone to complete online homework assignments and submit activities on Canvas.

You should keep a **notebook** (paper or digital) where you take step by step notes and work the problems and upload them on Canvas on weekly basis.

Prerequisite:

Mathematics 1D with a grade of C or better.

Student Responsibility and Independent Learning:

As a transfer-level course, this class is designed with the expectation that students will take an active and independent role in their learning. While the instructor provides guidance, structure, and support, students are expected to engage thoughtfully with the assigned materials and take initiative in developing their understanding of the concepts presented.

Students should also make an effort to explore connections between course topics and applications within their intended majors, as well as engage thoughtfully with projects and extended problems. Success in this course requires initiative, intellectual curiosity, and consistent effort outside of scheduled coursework. The instructor will provide guidance and support, but mastery of the material depends on the student's sustained and independent work.

Group Activity:

There will be required group activities. Even though the problems will be discussed in group, write up your own solutions independently.

- **Every member** of the group will be taking a role.
- Your name and your role should be written at the top of the first page.
- Work must be NEAT and ORGANIZED. Do problems IN ORDER.
- It is important for you to SHOW YOUR WORK! You are graded on the work you show to get the final answer, not just the final answer. Be sure to show your "scratch work" that goes with the problem.

Discussions: There will be discussion topics posted throughout the term. The deadline for responding to the topic will be indicated when the assignment is posted. You may not respond to the discussion once the deadline has passed.

Homework:

Written sets for submission: During the term, I will send out homework and group activities sets to be discussed, written up, and submitted on Canvas. Homework and group activities is essential in any math class. You cannot expect to pass the class without putting consistent effort into homework and group activities. Show all work and explain any reasoning. You may not submit your assignments once the deadline has passed.

HW Guidelines:

The process of solving homework problems reflected in step-by-step solutions. The following are some specific criteria:

Guidelines for homework:

- Your name, class, and section number should be written at the top of the first page.
- Work must be NEAT and ORGANIZED. Write the questions (problems) IN ORDER. Following the format displayed on Canvas.
- It is important for you to SHOW YOUR WORK! You are graded on the work you show to get the final answer, not just the final answer. Be sure to show your "scratch work" that goes with the problem. All work you submit must be written up individually in your own words, and you shouldn't ever submit work that you wouldn't be comfortable explaining clearly to another student or to the instructor.
- Do your work underneath the assigned problem then circle your final answer.
- At the end of each homework assignment, write a brief "Chat" paragraph

  - A key component in learning is thinking about how and what you are learning. What are you doing that is working? What areas could you improve upon? What comes easily for you? Is there a pattern in your homework? At the end of each homework assignment, write a very brief paragraph about what you learned, what you feel you need to review, and any thoughts or feelings you have about the math you're doing. This is also a great opportunity for you to communicate with your instructor! There are no "right" answers. Be honest and use this as a learning process.

Even though the problems will be discussed in group, write up your own solutions independently.

Homework Format

Question 1	Prove that the function $$f(x,y)=\begin{cases}\frac{(2^x-1)(\sin y)}{xy} & \text{if } xy\neq 0\\ \ln 2 & \text{if } xy=0\end{cases}$$ is continuous at $(0,0)$.
Step by step solution	To solve this problem it is necessary to show that $\lim_{(x,y)\to(0,0)} f(x,y)=f(0,0)=\ln 2$. Consider the following: $$\lim_{(x,y)\to(0,0)}\frac{(2^x-1)\sin y}{xy}=\lim_{(x,y)\to(0,0)}\frac{2^x-1}{x}\cdot\frac{\sin y}{y}=\left(\lim_{x\to 0}\frac{2^x-1}{x}\right)\left(\lim_{y\to 0}\frac{\sin y}{y}\right)=\lim_{x\to 0}\frac{(\ln 2)2^x}{1}\cdot(1)=\ln 2$$ (Using L'Hopital's Rule on the limit in terms of x.) Thus since $\lim_{(x,y)\to(0,0)} f(x,y)=f(0,0)$, we see that $f(x,y)$ is continuous at $(0,0)$.
The end of the homework set reflection or chat	A key component in learning is thinking about how and what you are learning. What are you doing that is working? What areas could you improve upon? What comes easily for you? Is there a pattern in your homework? At the end of each homework assignment, write a very brief paragraph about what you learned, what you feel you need to review, and any thoughts or feelings you have about the math you're doing. This is also a great opportunity for you to communicate with your instructor! There are no "right" answers. Be honest and use this as a learning process.

Projects: Projects will be assigned throughout the term. Project due dates are indicated on Canvas. You may not submit your assignments once the deadline has passed. Even though the problems will be discussed in group, write up your own solutions independently.

Exam Reviews: There will be an exam review assigned before each exam. The purpose of the review is to aid the student in studying for the exams. You may not submit your assignments once the deadline has passed. Even though the problems will be discussed in group, write up your own solutions independently.

Question 1	Prove that the function $f(x, y) = \begin{cases} \dfrac{(2^x - 1)(\sin y)}{xy} & \text{if } xy \neq 0 \\ \ln 2 & \text{if } xy = 0 \end{cases}$ is continuous at $(0, 0)$.
Step by step solution	To solve this problem it is necessary to show that $\lim_{(x,y)\to(0,0)} f(x, y) = f(0, 0) = \ln 2$. Consider the following: $\lim_{(x,y)\to(0,0)} \frac{(2^x - 1)\sin y}{xy} = \lim_{(x,y)\to(0,0)} \frac{2^x - 1}{x} \cdot \frac{\sin y}{y} = \left(\lim_{x\to 0} \frac{2^x - 1}{x}\right)\left(\lim_{y\to 0} \frac{\sin y}{y}\right) = \lim_{x\to 0} \frac{(\ln 2)2^x}{1} \cdot (1) = \ln 2$ (Using L'Hopital's Rule on the limit in terms of x.) Thus since $\lim_{(x,y)\to(0,0)} f(x, y) = f(0, 0)$, we see that $f(x, y)$ is continuous at $(0, 0)$.

<u>Midterm Exams</u>: There will be three midterm exams. Each exam includes handwritten portion which you will upload to Canvas. Each midterm exam will focus the material covered since the previous exam. More details on exam dates and procedures can be found in Canvas. You may not submit your assignments once the deadline has passed.

Question 1	Prove that the function $f(x, y) = \begin{cases} \dfrac{(2^x - 1)(\sin y)}{xy} & \text{if } xy \neq 0 \\ \ln 2 & \text{if } xy = 0 \end{cases}$ is continuous at $(0, 0)$.
Step by step solution	To solve this problem it is necessary to show that $\lim_{(x,y)\to(0,0)} f(x, y) = f(0, 0) = \ln 2$. Consider the following: $\lim_{(x,y)\to(0,0)} \frac{(2^x - 1)\sin y}{xy} = \lim_{(x,y)\to(0,0)} \frac{2^x - 1}{x} \cdot \frac{\sin y}{y} = \left(\lim_{x\to 0} \frac{2^x - 1}{x}\right)\left(\lim_{y\to 0} \frac{\sin y}{y}\right) = \lim_{x\to 0} \frac{(\ln 2)2^x}{1} \cdot (1) = \ln 2$ (Using L'Hopital's Rule on the limit in terms of x.) Thus since $\lim_{(x,y)\to(0,0)} f(x, y) = f(0, 0)$, we see that $f(x, y)$ is continuous at $(0, 0)$.

Final Exam: The final exam will cover all material from throughout the term. More details on the final exam will be available on Canvas.

Question 1	Prove that the function $$f(x, y) = \begin{cases} \frac{(2^x - 1)(\sin y)}{xy} & \text{if } xy \neq 0 \\ \ln 2 & \text{if } xy = 0 \end{cases}$$ is continuous at $(0, 0)$.
Step by step solution	To solve this problem it is necessary to show that $\lim_{(x,y)\to(0,0)} f(x, y) = f(0, 0) = \ln 2$. Consider the following: $$\lim_{(x,y)\to(0,0)} \frac{(2^x - 1)\sin y}{xy} = \lim_{(x,y)\to(0,0)} \frac{2^x - 1}{x} \cdot \frac{\sin y}{y} = \left(\lim_{x\to 0} \frac{2^x - 1}{x}\right)\left(\lim_{y\to 0} \frac{\sin y}{y}\right) = \lim_{x\to 0} \frac{(\ln 2)2^x}{1} \cdot (1) = \ln 2$$ (Using L'Hopital's Rule on the limit in terms of x.) Thus since $\lim_{(x,y)\to(0,0)} f(x, y) = f(0, 0)$, we see that $f(x, y)$ is continuous at $(0, 0)$.

No makeups for the final can be provided. The final grade cannot be dropped.

For each exam, if the step by step solution is missing or your answer is not consistent with your step by step solution, you only receive 10% of the grade.

Sample Rubrics that I follow:

(10 points) Calculate the following limit or justify why it does not exist. $\lim_{x\to 1} \frac{1-x}{1-\sqrt{x}}$

SOLUTION:

$$\begin{aligned} \lim_{x\to 1} \frac{1-x}{1-\sqrt{x}} &= \lim_{x\to 1} \frac{1-x}{1-\sqrt{x}} \cdot \frac{1+\sqrt{x}}{1+\sqrt{x}} \\ &= \lim_{x\to 1} \frac{(1-x)(1+\sqrt{x})}{1-x} \\ &= \lim_{x\to 1} (1+\sqrt{x}) = 2 \end{aligned}$$

GRADING RUBRIC:

0 points – If the student uses L'Hopital's Rule

2 points – If the student got a $\frac{0}{0}$ limit by plugging in $x = 1$, but did nothing else

4 points – If the student knew to multiply numerator and denominator by $1 + \sqrt{x}$, but did not do it correctly; this includes not canceling $\frac{1-x}{1-x}$

7 points – If the student properly rationalized and got to $\lim_{x\to 1}(1 + \sqrt{x})$, but did not evaluate the limit correctly

10 points – If the student properly rationalized and got the correct limit

-3 points – If the student did not write $\lim_{x\to 1}$ anywhere

Grading Policy:

Homework, Group Activities, and Discussion	200 pts (25%)
Projects and Presentation	100 pts (12.5%)
Midterm Reviews/ Midterms	300 pts (37.5%)
Final	200 pts (25%)
Total	**800 pts**

A	100%	to 94.5%
A-	< 94.5%	to 89.5%
B+	< 89.5%	to 86.5%
B	< 86.5%	to 83.5%
B-	< 83.5%	to 79.5%
C+	< 79.5%	to 74.5%
C	< 74.5%	to 69.5%
D+	< 69.5%	to 66.5%
D	< 66.5%	to 63.5%
D-	< 63.5%	to 59.5%
F	< 59.5%	to 0%

Important Dates and Deadlines: http://www.deanza.edu/calendar/dates-and-deadlines.html

De Anza Final exams schedule: https://www.deanza.edu/calendar/final-exams.html

For detailed information on Homework, Quizzes, Projects, Discussion please log into your Canvas course page.

Grade Changes

Grade changes are made only for clerical errors. I will not change grades for any other reason.

Important Notes:

There will be regular online homework, quizzes. You will have a limited amount of time to complete the quizzes, homework, and discussions.

Any late submissions are penalized at a rate of 10% per day.

No makeup quizzes will be given, even if the absence is excused. If you miss an quiz, you will receive a 0% on it.

Dropping

Students will **not** be automatically dropped for non-attendance. Although I do reserve the right to drop students for non-attendance, it is the **student's responsibility** to officially drop or withdraw from the course – if you fail to do so and your name appears on the final roster, you will receive an F for the term. Do not assume that I will drop you if you stop coming to class.

Academic Integrity:

All students are expected to exercise high levels of academic integrity throughout the quarter. You are encouraged to work together but you are expected to write up your answers independently. Any instances of cheating or plagiarism will result in disciplinary action, including getting a '0' on the assignment and report to the PSME dean, which may lead to dismissal from the class or the college

Student Honesty Policy:

"Students are expected to exercise academic honesty and integrity. Violations such as cheating and plagiarism will result in disciplinary action which may include recommendation for dismissal."

Disabled Services:

Students who have been found to be eligible for accommodations by Disability Support Services (DSS), please follow up to ensure that your accommodations have been authorized for the current quarter. If you are not registered with DSS and need accommodations, please go to http://www.deanza.edu/dss.

This syllabus is subject to change at the instructor's discretion. Changes will be announced in class and on Canvas.

Recipe for Success:

- If you ever have any questions, Email me! You are welcome to send email to me whenever you need help!
- Visit the Tutoring Center.
- Form an study group.
- Watch all lectures, participate in every discussion, and complete every homework assignment.
- Read the sections to be discussed in class prior to the lecture

Section	Course Content
1.1	Definitions and Terminology
1.2	Initial-Value Problems
2.1	Solution Curves Without a Solution
2.2	Separable Equations
2.3	Linear Equations
2.4	Exact Equations
2.5	Solutions by Substitutions
3.1	Linear Models
3.2	Nonlinear Models
3.3	Modeling with Systems of First-Order DEs
4.1	Preliminary Theory—Linear Equations
4.2	Reduction of Order
4.3	Homogeneous Linear Equations with Constant Coefficients
4.4	Undetermined Coefficients—Superposition Approach
4.5	Undetermined Coefficients—Annihilator Approach
4.6	Variation of Parameters
4.7	Cauchy-Euler Equations
4.9	Solving Systems of Linear DEs by Elimination
4.10	Nonlinear Differential Equations
5.1	Linear Models: Initial-Value Problems
6.1	Review of Power Series
6.2	Solutions About Ordinary Points
7.1	Definition of the Laplace Transform
7.2	Inverse Transforms and Transforms of Derivatives
7.3	Operational Properties I
7.4	Operational Properties II
7.5	The Dirac Delta Function
7.6	Systems of Linear Differential Equations

Tentative Schedule

WEEK	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	Friday
1		Ch 1		Ch 1	
2		Ch 1		Ch 2	
3		Ch 2		Exam 1	
4		Ch 3		Ch 3	
5		Ch 3		Ch 3 Submit the first draft of the project	
6		Ch 4		Exam 2	
7		Ch 4		Ch 4	
8		Ch 4		Ch 6 Submit the second draft of the project	
9		Ch 6		Ch 6	
10		Ch 6		Exam 3	
11		Ch 7		Final Review Submit the project	

Week 12 is dedicated to the final exam.

https://www.deanza.edu/calendar/final-exams.html

Student Learning Outcome(s):

- Construct and evaluate differential equation models to solve application problems.
- Classify, solve and analyze differential equation problems by applying appropriate techniques and theory.

Office Hours:

T,TH	12:00 PM - 3:30 PM	PST Village
F	9:00 AM - 10:00 AM	Zoom
M,W	9:00 AM - 10:30 AM	Zoom