Mathematics 2471: Calculus I.

Academic Semester/Term: Spring 2020

Course description (from catalog): A first course in differential and integral calculus which stresses limits as well as the applications of calculus to the problems of science.

Instructor: Hiro Lee Tanaka

Course section number, classroom & meeting time: Section 252, Ingram 03102, MWF 9 – 9:50 AM

Instructor's office number: MCS 452

Departmental phone: 512-245-3935

Email: hiro@txstate.edu

Names & email addresses of TA's, GA's, laboratory assistants, supplemental instructors (if applicable): Farah Najdawi (GA), fzn1@txstate.edu

Office hours: 10:10 – 11:00 AM MW

General Education Core Curriculum (Code 020)

Mathematics Component Outcomes

Students will interpret key mathematical concepts and apply appropriate quantitative tools to everyday experience.

Core Objectives/Competencies Outcomes:

- **Critical Thinking**
  - Students will demonstrate creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information.
- **Communication**
  - Students will effectively develop, interpret and express ideas through written, oral and visual communication.
- **Empirical and Quantitative Skills**
  - Students will manipulate and analyze numerical data or observable facts resulting in informed conclusions.

SYLLABUS: MATH 2471, CALCULUS I (SPRING 2020)

HIRO LEE TANAKA

1. Logistics

- Instructor: Hiro Lee Tanaka (you can call me Hiro)
- Meeting Times: very Monday, Wednesday, and Friday at 9 AM. We meet in Bruce and Gloria Ingram Hall 03102.
- Lab: You have "lab" section every Tuesday and Thursday, 9:30 am - 10:50 am, in Bruce and Gloria Ingram Hall 03102.
- Office: MCS 452.
- Office Hours: 10:10 AM to 11 AM on Mondays and Wednesdays.
- My email: `hiro@txstate.edu`
- My department phone number: 512-245-3935
- Your GA (Graduate Assistant) is Farah Najdawi. Her e-mail address is `fzn1@txstate.edu`.

1.1. **Grades.** Here is the grading rubric:

- Class quizzes: 20 percent
- Lab: 10 percent
- Writing assignments/Homework: 20 percent
- Exam I: 15 percent
- Exam II: 15 percent
- Final exam: 20 percent

1.2. **Quizzes.** Almost every lecture, you will be given a quiz at the beginning of class. There may also be quizzes during lab.

1.3. **Exams.** There will be three exams in this class.

Exam I: (Thursday, March 5, 2019) Derivatives, limits, and applications

Exam II: (Thursday, April 9, 2019) Integrals and applications

Final Exam (Friday, May 8, 2020, 8 AM - 10:30 AM)

1.4. **Absence/attendance policy.** You need a good reason to be absent from class and lab. Your absence should be substantiated by documentation in a timely manner; otherwise, your absence will not be excused, and any quiz or homework not turned in as a result of your absence will be counted as a zero. Only extreme cases will merit

absences from exam days; we will arrange for another time for you to take the exam in such cases.

2. TX-State-Specific Information

2.1. General Education Core Curriculum (Code 020).

2.1.1. *Mathematics Component Outcomes.* Students will interpret key mathematical concepts and apply appropriate quantitative tools to everyday experience.

2.1.2. *Core Objectives/Competencies Outcomes:*

- Critical Thinking
  - Students will demonstrate creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information.
- Communication
  - Students will effectively develop, interpret and express ideas through written, oral and visual communication.
- Empirical and Quantitative Skills
  - Students will manipulate and analyze numerical data or observable facts resulting in informed conclusions.

2.2. **Honor Code.** Policy mandates that I provide "a statement describing Texas State's Honor Code policy and a Web reference." Here is the web reference:

`https://policies.txstate.edu/university-policies/07-10-01.html`

In a nutshell, don't cheat. But you might not know the line between cheating and not cheating sometimes; you can see my personal take on academic integrity below.

3. Academic Integrity (Hiro's take)

You do not get many chances in life to learn something; it is also rare to get straightforward feedback on what you need to do to improve. Any form of cheating or copying robs you of such chances. To get feedback on someone else's work is useless to you in most cases, and to allow someone else to duplicate your ideas robs that person of a chance to think more on their own, or to get honest feedback about what they need to do to succeed. Add on top of that the potential punitive consequences of being caught—nobody feels good about having to initiate an academic honesty investigation—and you'll find a mountain of disincentives. I expect that you will not rob yourself, or

rob others, of the time to think for one's self and the opportunity to receive feedback appropriate to one's particular state.

I also trust in your maturity to distinguish between collaboration and plagiarism. Collaborations are encouraged, should be acknowledged in all work you submit ("I worked with so-and-so."), and must also be mutual (it's not a collaboration unless the other parties agree to it); this is just as in other areas of life.

Finally, most plagiarism or cheating occurs as a consequence of other factors in your life. Make sure you place yourself in a position to succeed and think. Give yourself time to do homework. Beginning on the night before a due date is often not good enough, because math takes a very long time to think through. Working both a full-time job and taking four classes takes away this time—if possible, you should consult with the financial aid office to explore options for working less or taking fewer classes. (Though, in my opinion, every student should be provided the resources to take classes without having to have a full-time job.)

4. Resources

4.1. **Your learning matters.** It is the University's goal that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, contact the Office of Disability Services as soon as possible at 512.245.3451 to establish reasonable accommodations. Please be aware that the accessible table and chairs in this room should remain available for students who find that standard classroom seating is not usable.

For more information, see:

`https://www.ods.txstate.edu/faculty-and-staff-resources/resources.html`

4.2. **Online documents.** There are many resources available to you for the calculus sequence. Make sure to take advantage of them—resources like these are usually not available later in your college careers.

The math department has posted PDF files of useful facts for people taking Calculus II: `https://www.math.txstate.edu/resources-student/mathcats/course/2472.html`

4.3. **Textbook.** The standard reference used by Calculus Courses at Texas State University is the book Calculus, 8th edition, by J. Stewart.

If you need an additional reference, use the free online textbook of Guichard. A link is on the course website, and here:

`https://lyryx.com/calculus-early-transcendentals/`

Also, you should not be afraid to use Google to find other calculus textbooks in the world.

4.4. **Math CATS and CalCentral (Free tutors).** The math department has calculus tutors ready to help you at Math CATS every day. For more details, see their website: `https://www.math.txstate.edu/resources-student/mathcats`

5. Course content

5.1. **Purpose and Objectives of course.** For you to learn how to *think* about the central topics of calculus—limits, derivatives, and integrals—and for you to learn how to *use* them (to study functions, and to study and model real-life phenomena).

5.2. **Description of content of course.** I am not a fan of the course catalogue description—it's not exactly precise, nor well-written. My goal in this course is to teach you brand new ways to study functions. How does the value of a given function change? (Derivatives.) Does a function approach some value in the long run? (Limits and asymptotes.) How do we compute the average value of a function, or the area under the graph of a function? (Integrals.) These are incredibly difficult topics that took hundreds of years of human history to make precise–the Greeks knew they needed these ideas (700 BC - 400 AD), Newton and Leibniz developed our modern foundations (1600s to early 1700s), and we now use the tools of calculus throughout the quantitative sciences. You will learn the foundations on how to harness these tools.

5.3. **Outline.** Here is a very rough outline of the day-by-day topics. **The actual day-by-day coverage will most likely change** based on student needs and time constraints.

Date	Topic	Guichard reference	Stewart 8th ed. reference
Jan 22	Getting used to rates of change as slope	(4.1)	1.4
Jan 24	Instantaneous rates of change and difference quotients, definition of derivative	(4.1, 4.2)	1.4
Jan 27	Definition of derivative, introduction to limits	(4.1, 4.2, 3.1, 3.2)	1.5, 2.1
Jan 29	Limits defined; left and right limits, "limit laws"	(3.1, 3.2, 3.3, 3.4)	1.5, 1.6
Jan 31	Examples of limits, continuity, examples of continuous functions	(3.1, 3.2, 3.3, 3.4)	1.5, 1.6, 1.7, 1.8
Feb 3	Continuity and Intermediate Value Theorem	(3.7)	1.8
Feb 5	Computing derivatives: Product rule and sums and polynomials	(4.2, 4.3)	2.1, 2.2, 2.3
Feb 7	Derivatives of sine and cosine; squeeze theorem for limits	(4.3, 4.4, 3.6)	2.4, 1.6
Feb 10	Chain rule	(4.5)	2.5
Feb 12	Exponentials and logarithms	(4.6)	6.2, 6.3
Feb 14	Studying and sketching curves: First and second derivatives, concavity, monotonicity	(5.6)	3.3
Feb 17	Sketching curves, II: Asymptotes and limits at infinity	(5.6)	3.3, 3.4
Feb 19	Techniques: Implicit differentiation	(4.7)	2.6
Feb 21	Applications: Continuity and extrema/min/max, optimization	(5.2)	3.1, 3.7
Feb 24	Applications: Mean value theorem	(5.3)	3.2
Feb 26	Applications: Related rates	(5.1)	2.8
Feb 28	Applications: L'Hopital's Rule	(5.5)	6.8
Mar 2	Applications: Taylor polynomials	(5.4)	
Mar 4	Exam Review, or day to cover uncovered material	EXAM ON MAR 5	

Date	Topic	Guichard reference	Stewart 8th ed. reference
Mar 6	Integration and area; Riemann sums	(6.1)	4.1, 4.2
Mar 9	Riemann sums and Fundamental Theorem of calculus	(6.1, 6.2)	3.9, 4.3
Mar 11	Integration techniques: u substitution	(7.1)	4.5
Mar 13	Integration techniques: Integration by parts	(7.4)	
Mar 16	Spring Break		
Mar 18	Spring Break		
Mar 20	Spring Break		
Mar 23	Applications: Area between curves	(8.5)	5.1
Mar 25	Applications: Volume	(8.3)	
Mar 27	Applications: Surface area	(8.8)	
Mar 30	Applications: Arc length	(8.7)	
Apr 1	Applications: Averages	(8.4)	5.5
Apr 3	Integration techniques: Improper integrals and limits at infinity	(7.7, 3.5)	4.4
Apr 6	Integration techniques: Improper integrals and limits at infinity	(7.7, 3.5)	4.4
Apr 8	Exam Review, or day to cover uncovered material	EXAM on APR 9	

Date	Topic	Guichard reference	Stewart 8th ed. reference
Apr 10	Integration techniques: Trig functions and their powers	(7.2, 7.3)	
Apr 13	Integration techniques: Trig functions and their powers	(7.2, 7.3)	
Apr 15	Integration techniques: Rational functions	(7.5)	
Apr 17	Application: Differential equations, exponential growth and decay, isotope dating	(10.1)	6.4, 6.5
Apr 20	Application: Newton's Method	(5.4)	3.8
Apr 22	Extra day for applications as necessary.		
Apr 24	Expanding your ken: Hyperbolic sines, cosines	(2.7)	6.7
Apr 27	Expanding your ken: Inverse Trig Functions	(2.6)	6.6
Apr 29	Expanding your ken: Taylor series, sine and cosine		
May 1	Expanding your ken: Complex numbers, Euler's formula		
May 4	Last day of class. Exam Review, or day to cover uncovered material		
May 8	Final Exam 8 AM - 1030 AM		