MATH 110

Techniques of Calculus I

Sample Syllabus

Description

MATH 110 is an entry-level course in mathematics that introduces the skills associated with the application of calculus techniques to business and social science applications. We will review and deepen our understanding of polynomial and exponential functions as well as introduce the concepts of derivatives and integration. Most topics will be explored analytically and graphically as they are applied to real life examples and problems. Students are expected to study the concepts and examples and be able to extend the skills and techniques to the solution of similar problems.

Prerequisite

MATH 022 or satisfactory performance on the mathematics proficiency examination.

Objectives

Math 110, Techniques of Calculus I focuses on learning and practicing the fundamental rules of calculus and their applications to business and the social sciences. You will get some exposure to mathematical proofs in the readings and lectures. I will take many opportunities to remind you of the underlying concepts during lecture, and you should attain a broad conceptual understanding of the theory by semester's end. You will be pushed to consider concepts more deeply during activities and group discussion. However, the assessments and exams are problem centered.

Upon successful completion of this course, the student should be able to:

- Identify polynomial, rational, power, exponential, and logarithmic functions.
- Calculate the domains of polynomial, rational, power, exponential, and logarithmic functions.

- Calculate the sums, differences, products, quotients, and compositions of functions.
- Model cost, revenue, profit, supply, and demand business functions.
- Calculate equilibrium points within supply/demand markets and interpret the results.
- Calculate or estimate finite/infinite limits of functions given by formulas, graphs, or tables.
- Calculate one-sided limits of functions.
- Determine whether a function given by a graph or formula is continuous at a given point or on a given interval.
- Determine whether a function given by a graph or formula is differentiable at a given point or on a given interval.
- Distinguish between average and instantaneous rate of change and interpret the definition of the derivative graphically.
- Determine derivatives of some functions using the definition of derivative of a function.
- Calculate derivatives of polynomial, rational, power, exponential, and logarithmic functions, and combinations of these functions.
- Calculate derivatives of implicitly defined functions.
- Apply the ideas and techniques of derivatives to related rate problems to include basic algebraic/geometric models and cost/average cost, revenue/average revenue, profit/average profit, supply, and demand models
- Apply the ideas and techniques of derivatives to perform marginal analysis of basic economics models.
- Apply the ideas and techniques of derivatives to calculate elasticity of basic economics models.
- Apply the ideas and techniques of derivatives to finding extrema.
- Apply the ideas and techniques of derivatives to graphing functions.
- Apply the ideas and techniques of derivatives to optimization problems to include basic algebraic/geometric models and cost, revenue, profit, supply, and demand models.
- Apply the ideas and techniques of derivatives to solve compound interest, continuous interest, effective interest rate, and present value business models.
- Calculate the Riemann sum for a given function, partition and collection of evaluation points.
- Describe a definite integral as the limit of a Riemann sum.
- Determine anti-derivatives of basic algebraic functions.

- Calculate values of definite integrals using anti-derivatives and areas.
- Apply substitution techniques to integrate basic functions.
- Apply the ideas of definite integrals to solve problems of areas.
- Calculate the average value of business models using the definite integral.
- Apply the ideas and techniques of the definite integral to evaluate consumer/producer surplus, future/present value of income streams, and annuity business models.

Textbook

Applied Calculus for the Managerial, Life, and Social Sciences A Brief Approach, 8th Edition by S. T. Tan (Brooks/Cole, 2009)

Lessons

Each lesson will include a set of prerecorded lectures covering topics for the week. These lectures are typically 10-15 minutes in length (60-90 mins total). Each lecture covers one or two particular topics or concepts, along with examples. This allows you to focus on one topic at a time, at your own pace, though the pace must be fast enough to keep up with the overall course.

Activity

Each week there will be an activity containing additional suggested problems and conceptual questions with solutions. This activity is not graded, but working through the problems and questions should be helpful in preparing you for quizzes and exams.

Office Hours / Recitation

Each week (time to be determined and announced) there will be a live recitation. This will be an opportunity for you to get more in depth feedback about particular problems, review more involved examples, and be reminded of important concepts in the week's lesson. These sessions will be recorded for those who are not able to attend the live lecture. However, the content of the recitation will depend on your questions and/or the points of difficulty in the lesson. If you are not able to attend

the live lecture, you may still submit questions via email or the discussion forum on Piazza.

Problem Quiz (30 pts)

Each lesson will have a problem quiz worth 30 points. You can take each problem quiz up to 3 times; you will have immediate feedback on the solutions after taking each quiz. Your quiz grade will be based on the highest score of the 3 attempts. Your overall quiz score for the course will be based on the ten best lessons.

Concept Quiz (10 pts)

Each lesson will have a concept quiz worth 10 points. You are only allowed one attempt on the concept quiz. Make sure you read through the lesson activity and try the practice questions there before taking the concept quiz.

Grading

Assignments	Points
2 Midterm Exams (Proctored, 150pts each)	300
11 Weekly Lessons, (40pts each)	400
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Concept Quizzes (Best 10)	100
Problem Quizzes (Best 10)	300
Final Exam (Proctored)	300
Total	1000

Grading Scale

Letter Grade	% Score	Total Points

A	93-100%	926-1000
A-	90-92%	896-925
B+	87-89%	866-895
B	83-86%	826-865
B-	80-82%	796-825
C+	77-79%	766-795
C	70-76%	696-765
D	60-69%	596-695
F	0-59%	0-595

Arranging a Proctor

You will need to secure a proctor in order to take exams in this course. A proctor will not automatically be assigned to you; rather, you must make the necessary contacts to secure a professional who will serve in this capacity.

- Contact a person who meets the qualifications and ask him or her to proctor your exam.
- Student Services must approve your proctor before any exams can be taken. Please see instructions for securing a suitable proctor . While many proctors will serve on a voluntary basis, you are responsible for paying any expenses incurred in retaining a proctor.
- You must complete a Proctor Information Form and submit the completed form with the proctor verification documentation. Note: If your proctor has been previously approved by the World Campus during a prior course within two years, you do not need to obtain verification. World Campus retains proctor information on file for two years.
- If your proctor does not meet the required specifications, Student Services will notify you within 5 to 7 business days.
- You will need to complete an Exam Request Form for each exam. Contact your proctor to confirm the date, time, and location of your exam(s). Complete the form 3 weeks prior to your scheduled exam

to allow for processing the request and mailing exams to proctors. If you are located outside the United States, in order to allow adequate time for mailing, please plan to request your exam earlier than 3 weeks prior to the exam week.
- Contact Student Services if you cannot take a scheduled exam.

Academic Integrity

Academic integrity is the pursuit of scholarly activity in an open, honest and responsible manner. Academic integrity is a basic guiding principle for all academic activity at The Pennsylvania State University, and all members of the University community are expected to act in accordance with this principle. Consistent with this expectation, the University's Code of Conduct states that all students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts.

Academic integrity includes a commitment by all members of the University community not to engage in or tolerate acts of falsification, misrepresentation or deception. Such acts of dishonesty violate the fundamental ethical principles of the University community and compromise the worth of work completed by others.

Accommodating Disabilities

Penn State welcomes students with disabilities into the University's educational programs. Every Penn State campus has an office for students with disabilities. The Student Disability Resources (SDR) website provides contact information for every Penn State campus . For further information, please visit Student Disability Resources website.

In order to receive consideration for reasonable accommodations, you must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: See documentation guidelines . If the documentation supports your request for reasonable accommodations, your campus disability services office will provide you with an accommodation letter. Please share this letter with your instructors and discuss the accommodations with them as early as possible. You must follow this process for every semester that you request accommodations.

Counseling and Psychological Services

Many students at Penn State face personal challenges or have psychological needs that may interfere with their academic progress, social development, or emotional wellbeing. The university offers a variety of confidential services to help you through difficult times, including individual and group counseling, crisis intervention, consultations, online chats, and mental health screenings. These services are provided by staff who welcome all students and embrace a philosophy respectful of clients' cultural and religious backgrounds, and sensitive to differences in race, ability, gender identity and sexual orientation.

- Counseling and Psychological Services at University Park (CAPS): 814-863-0395
- Counseling and Psychological Services at Commonwealth Campuses
- Penn State Crisis Line (Available 24 hrs, 7 days a week): 877-229-6400
- Crisis Text Line (Available 24 hrs, 7 days a week): Text LIONS to 741741

Educational Equity / Report Bias

Penn State takes great pride to foster a diverse and inclusive environment for students, faculty, and staff. Acts of intolerance, discrimination, or harassment due to age, ancestry, color, disability, gender, gender identity, national origin, race, religious belief, sexual orientation, or veteran status are not tolerated and can be reported through Educational Equity via the Report Bias