



Math 233 – Calculus I Course Syllabus

Course description: Limits, continuity, differential calculus of algebraic and transcendental functions with applications, basic antidifferentiation with substitution, definite integrals.

Credit hours: 4

Course Prerequisites and Corequisites: MTH 139 or MTH 140

Course outline:

	<u>Approximate time spent</u>
• Limits and continuity	30%
○ Limits at a point	
▪ Formal definition	
▪ Existence	
▪ Infinite limits/vertical asymptotes	
○ Limits to infinity/horizontal asymptotes	
○ Algebraic evaluation	
▪ Basic rules/techniques	
▪ Sandwich Theorem	
○ Continuity/Intermediate Value Theorem	
• Derivatives and antiderivatives	30%
○ Definition of derivative/interpretations	
○ Derivative rules	
▪ Basic rules	
▪ Transcendental rules	
▪ Product and Quotient rules	
▪ Chain rule/implicit differentiation	
○ Antiderivative rules	
▪ Basic rules	
▪ Transcendental rules	
▪ Substitution	
• Applications of derivatives	30%
○ Related rates	
○ Position, velocity, and acceleration	
○ Extreme values/optimization	
○ Mean Value Theorem	
○ Curve sketching	
○ Newton's method	
○ L'Hopital's Rule	
• Definite integration	10%
○ Definition of the definite integral/interpretations (area, etc.)	
○ Riemann sums	
○ The Fundamental Theorem of Calculus	
○ Definite integrals with substitution	

Student Learning Outcomes (SLO): At the end of MTH 233, a student who has studied and learned the material should be able to:

1. Find limits using graphs, algebraic techniques, and L'Hopital's Rule. [PLO: 2,4], [EEO: 2, 4, 5]
2. Demonstrate an understanding of the connection between limits and asymptotic behavior in functions. [PLO: 2,4,5] , [EEO: 2, 3, 5]
3. Recognize and construct continuous functions. [PLO: 4] , [EEO: 2, 5]
4. Connect the definitions of the derivative and definite integral to their geometric interpretations and applications. [PLO: 1] , [EEO: 1, 2, 5]
5. Find derivatives and antiderivatives of algebraic and transcendental functions, including compositions of functions. [PLO: 2,4] , [EEO: 2, 4]
6. Use implicit differentiation to solve related rates problems and to determine derivative rules for inverse transcendental functions. [PLO: 2,4] , [EEO: 1, 2, 4]
7. Use information revealed by limits and derivatives to sketch graphs of functions and find extreme values of functions on given intervals. [PLO: 2,4,5] , [EEO: 2, 4, 5]
8. Convey the connections between limits, derivatives, and integrals. [PLO: 1,5] , [EEO: 2, 3, 6]
9. Use the Fundamental Theorem of Calculus to evaluate definite integrals. [PLO: 1,2,4] , [EEO: 1, 4, 5]

Program Learning Outcomes (PLO):

Students graduating from SFASU with a B.S. degree and a major in mathematics will:

1. Demonstrate comprehension of core mathematical concepts. [**Concepts**]
(notion of theorem, mathematical proof, logical argument)
2. Execute mathematical procedures accurately, appropriately, and efficiently. [**Skills**]
(calculus, algebra, routine, nonroutine, applied)
4. Demonstrate competence in using various mathematical tools, including technology, to formulate, represent, and solve problems. [**Problem Solving**]
(calculus tools, algebra tools, applied tools, nonstandard problem solving)
5. Demonstrate proficiency in communicating mathematics in a format appropriate to expected audiences. [**Communication**]
(written, visual, oral)

Exemplary Educational Objectives (EEO):

1. To apply arithmetic, algebraic, geometric, higher-order thinking, and statistical methods to modeling and solving real-world situations.
2. To represent and evaluate basic mathematical information verbally, numerically, graphically, and symbolically.
3. To expand mathematical reasoning skills and formal logic to develop convincing mathematical arguments.
4. To use appropriate technology to enhance mathematical thinking and understanding and to solve mathematical problems and judge the reasonableness of the results.
5. To interpret mathematical models such as formulas, graphs, tables and schematics, and draw inferences from them.
6. To recognize the limitations of mathematical and statistical models.