

Math 1310-004/Engineering Calculus I/Fall 2014 Syllabus

Course webpage: www.math.utah.edu/~bertram/1310 and Canvas

Class meets: MTWF 10:45-11:35 in BEH S 114
(with an additional mandatory problem session each Thursday)

Instructor: Aaron Bertram Office: JWB 302

Office Hours: Before (10-10:35) and after (11:35-12:00) every class.

TA: Stefano Filipazzi Office: LCB Loft

Text: James Stewart, *Calculus, Concepts and Contexts*, 4th Edition.

Your Grade is based on homework, quizzes, attendance and exams.

Homework. There will be two assignments each week.

Class Homework is assigned each Monday, due on Friday.

Lab Homework is assigned each Thursday, due on Monday.

Quizzes. Weekly 10 minute quizzes at the start Friday's class.

Attendance. Thursday problem session attendance is mandatory!

Midterms. There will be two in-class midterms.

1st Midterm. Monday, October 6.

2nd Midterm. Monday, November 10.

Final. The final exam is on Monday, December 15 from 10:30-12:30.

Each component contributes to your grade as follows

Homework 10% + 10% = 20%

Quizzes 10%

Problem Session Attendance 10%

Midterms 15% + 15% = 30%

Final 30%

For students with disabilities

The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations. All information in this course can be made available in alternative format with prior notification to the Center for Disability Services.

Learning Objectives.

The goal of this course is for you to master the basic tools for the study of functions $f(x) = y$, termed “the calculus,” and use these tools for solving problems in science and engineering. These basic tools and problem solving skills are described below.

Tools and Skills.

You will learn how to transform functions into other functions through translations and rescaling, re-parameterizations, and function composition. You will learn the properties of special classes of functions including logarithms, exponentials, polynomials, and rational functions, and learn how to obtain inverses $f^{-1}(y) = x$ when they exist.

You will master the concept of a limiting value of a function $f(x) = y$ when x approaches a value c , know when a limit exists, utilize limit laws, learn how the continuity of a function at c relates to its limiting value, how asymptotic behavior can be described by limits, and how limiting values can be specified even when the value $f(c)$ is not defined.

You will understand how to use limits to compute the derivative f' of a function f that describes the rate of change of a function f . You will be able to utilize derivatives to model how two related quantities change with respect to each other, including motion of objects in terms of velocity and acceleration. You will also learn the methods of differentiation for different classes of functions including exponential and logarithmic functions, trigonometric and inverse trigonometric functions, power functions, and compositions, sums, products, and quotients of functions, as well as how to differentiate functions that are only implicitly defined via an equation.

You will learn how to utilize the derivative in applied contexts, including function approximation and how the average slope of a function relates to the derivative through the mean value theorem. If two quantities are related by an equation, you will be able to obtain the derivative of one quantity by knowing the derivative of the other. You will know how to utilize linear approximations to perform numerical/algorithmic equation solving via Newton’s method. You will be able to utilize the derivative to find maximum, minimum, or otherwise “optimal” input values for equations important in science, business, and engineering.

You will understand the definition of the integral of a function as the limiting value of an increasingly large weighted average of function values. You will be able to relate the integral to anti-differentiation, when appropriate, through the fundamental theorem of calculus. You will also be able to relate the integral to the area under the function's curve, know how to approximate the integral by a finite sum, and how to integrate over infinite-length domains. Specific integration techniques will also be mastered, including substitution, integration-by-parts, and partial fractions.

Problem solving fluency.

You will be able to read and understand problem descriptions, then be able to formulate equations modeling the problem usually by applying geometric or physical principles. Solving a problem often requires a series of transformations that include utilizing the methods of calculus. You will be able to select the appropriate calculus operations to apply to a given problem, execute them accurately, and interpret the results using numerical and graphical computational aids.

You will gain experience with problem solving in groups. You should be able to effectively transform problem objectives into appropriate problem solving methods through collaborative discussion. You will also learn how to articulate questions effectively with both the instructor and TA, and be able to explain your solutions to others.

Nuts and Bolts. (Sections are as they appear in the text.)

Week 1. §1.3,1.5, 1.6.

Functions, Compositions, Exponentials, Logarithms, Inverses

Week 2. §1.7-2.1, 2.2.

Parametric Curves, Velocity, Limits, Limit Laws

Week 3. §2.3-2.5

Continuity, Derivatives, Rate of Change.

Week 4. §2.5-2.7

Relationship between a Function and its Derivative.

Week 5. §2.8-3.2

Derivatives of Polynomials, Exponentials, Products and Quotients.

Week 6. §3.3-3.5

Derivatives of Trig Functions, Chain Rule, Implicit Differentiation.

Week 7. §3.6-3.8

Inverse Trig Functions, Logs and their Derivatives, Applications.

Week 8. §3.9-4.2

Linear Approximation, Differentials, Related Rates, Max/Mins.

Week 9. §4.3-4.5

Shapes of Curves, Graphing, l'Hôpital's Rule.

Week 10. §4.6-4.8

Optimization, Newton's Method, Antiderivatives.

Week 11. §5.1-5.3

Areas, Distances, Evaluating Definite Integrals

Week 12. §5.4-5.6

Fundamental Theorem of Calculus, Substitution, Integration by Parts.

Week 13. §5.7-5.9

Integration Techniques, Approximate Integration.

Week 14. §5.10, 6.1-6.2

Improper Integrals, Areas Between Curves, Volumes.

Week 15. Catch Up and Review.

Week 16. Finals Week (Hooray!).