**Time & Location** MTWF, 8:35-9:25 AM in JTB (James Talmage building) 120

**Instructor** Chris Miles

**Contact** Office hours: M 11:30 AM-12:30 PM, W 9:30-10:30 AM (after class) or by appointment
Office location: LCB (Leroy Cowles building) 326
Email: `miles@math.utah.edu`
Website: `www.math.utah.edu/~miles`

**Lab information** Instructor: Noah Ford (`ford@math.utah.edu`)
Section 11: Th 7:30-8:20 AM in AEB (Alfred Emery building) 306
Section 12: Th 8:35-9:25 AM in AEB 306

**Textbook** *Calculus: Concepts and Contexts*, $4^{th}$ edition by James Stewart, ISBN: 9780495557425. **(required)**
*Student solutions manual for Stewart's Calculus*, ISBN: 9780495560616. **(optional)**

**Course website** Canvas will be used for this course. It can be access via CIS, my website, or via: `utah.instructure.com`.

**Grading** The grade for each student will be calculated by the following breakdown:

**homework (10%) + lab (15+5=20%) + quizzes (15%) + 2 exams (2x15=30%) + final (25%)**.

Attendance to the lab section is **required**, and will count for 5% of a student's total grade. The remaining 15% of the lab grade will be determined by the lab submissions that will be graded.

Homework assignments will be given via the course website or in class. A subset of the problems will be selected to turn in to be graded (on a specified day, roughly weekly), but all of the problems assigned are recommended to the student to attempt and are considered fair game for material on exams and quizzes. Questions about homework can be asked in lecture *prior* to the homework being due. Late homework will not be accepted due to unfairness to the grader.

Quizzes will be weekly, tentatively Friday (unless noted otherwise). They will be approximately 15-20 minutes in length and therefore not take the whole class. They will cover the material discussed in class since the previous quiz. Quizzes missed will result in a grade of 0, but the lowest quiz grade will be dropped from every student's score.

There will be two mid-term exams. They are tentatively scheduled for the **weeks of September $29^{th}$ and November $10^{th}$**. The exact dates will be announced closer to the exam and will be determined based on the pace of the course.

**Final exam** All students are expected to take the comprehensive final exam and cannot pass the course without taking it. The room will be announced during the last week of classes. All students are expected to arrange their personal schedule to allow them to take the exam at this time. Students with conflicts should speak to the instructor as soon as possible but unless it is an absolute emergency no student will be allowed to take the final exam early. Note the time:

**FINAL EXAM: WEDNESDAY, DECEMBER 17, 2014 8:00-10:00 AM**

**Resources** The math department offers free drop-in tutoring for students. The center is located underneath the walkway between LCB and JWB and can be accessed by entering either building. They are open M-Th 8:00 AM-8:00 PM and F 8:00 AM-6:00 PM.

**Cheating** If a student is caught cheating on any homework, quiz, or exam, they will automatically receive a zero for that assignment. Depending on the severity of the cheating, they may fail the class.

**Course objectives** The goal of Math 1310 is 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 on the next page.

### Tools and skills

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

Students will master the concept of a limiting value of a function $f(x) = y$ when x approaches a value $c$, know when limits exists, utilize limit laws, how the property of 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 $f(c)$ is not defined.

Students will understand how to use limits to compute the derivative of a function $f'$ that describe or rate of change of a function $f$. Students will be able to utilize derivatives to model how two related quantities change with respect to each other, including motion of objects by in terms of velocity and acceleration. Students 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 differentiating functions that are only implicitly defined by an equation. Students will also be able 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, students will be able to obtain the derivative of one quantity by knowing the derivative of the other. Students will know how to utilize linear approximations to perform numerical/algorithmic equation solving via Newton's method. Also, students will be able to utilize the derivative to find maximum, minimum, or otherwise "optimal" input values for equations important in science, business, and engineering.

Students will understand the definition of the integral of a function as the limiting value of an increasingly large weighted average of function values. They will be able to relate the integral to anti-differentiation, when appropriate, through the fundamental theorem of calculus. Students 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. Finally, students will understand the key concept underlying integration, that it computes the net accumulation of a quantity through summation of the change in the quantity amount per unit of time or space, over an specified interval of time or space.

### Problem solving fluency

Students 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. Students 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.

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

**ADA statement**

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.

**Schedule**

**Week 1:** §1.3, §1.5-1.6 — functions, compositions, exponential function, logarithms, inverse functions
**Week 2:** §1.7-2.2 — 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 quotient of functions rules
**Week 6:** §3.3-3.5 — derivatives of trig functions, chain rule, implicit differentiation
**Week 7:** §3.6-3.8 — inverse trig functions, log Functions, and their derivatives, applications
**Week 8:** §3.9-4.2 — linear approximation, differentials, related Rates, max and min Values
**Week 9:** §4.3-4.5 — derivatives and 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, the definite integral, evaluating definite integrals
**Week 12:** §5.4-5.6 — Fundamental Theorem of Calculus, substitution Rule, integration by parts
**Week 13:** §5.7-5.9 — integration techniques, approximate integration
**Week 14:** §5.10, §6.1-6.1.2 — improper integrals, areas between curves, volumes
**Week 15:** review
**Week 16:** finals week: comprehensive final exam

*Note:* This syllabus is not a binding legal contract. It may be modified by the instructor when the student is given reasonable notice of the modification.