Syllabus for MATH-035-10, Calculus I, Summer 2018

Instructor: Michael Raney
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Office hours: By appointment
Textbook: Briggs, Cochran and Gillett, *Calculus: Early Transcendentals, Single Variable*, 3rd edition, Pearson
Course overview: This is the first part of the three-semester calculus sequence (MATH-035-036-137) for mathematics and science majors. Students do not need to have previous familiarity with calculus, but do need good algebra/precalculus preparation. Topics include limits, derivatives, techniques of differentiation, applications of the derivative, the Riemann integral, the trigonometric and inverse trigonometric functions, and the logarithmic and exponential functions.

Specific course objectives:

- Chapter 1 (Functions)
  - A brief review of functions: domain and range; function transformations; inverse, exponential and logarithmic functions; trigonometric and inverse trigonometric functions
- Chapter 2 (Limits)
  - The idea of limits: connection with instantaneous velocity and slope of a tangent line
  - Definition of limit (intuitive, not $\epsilon - \delta$)
  - Limit laws; one-sided limits; algebraic limit calculation techniques; Squeeze Theorem
  - Infinite limits; limits at infinity
  - Continuity; Intermediate Value Theorem
- Chapter 3 (Derivatives)
  - Definition of the derivative involving a limit; connection with rate of change and slope of a tangent line
  - Working with derivatives; comparing the graph of a derivative to that of the original function; differentiability implies continuity
  - Rules of differentiation (constant multiple rule, sum rule, power rule, product rule, quotient rule, etc.)
  - Chain Rule
  - Implicit differentiation
  - Derivatives as rates of change
  - Derivatives of exponential, logarithmic, trigonometric and inverse trigonometric functions; logarithmic differentiation
  - Related rates
- Chapter 4 (Applications of the deriative)
  - Absolute extrema on a closed interval; local extrema; critical points
  - Relation between derivatives and increasing/decreasing functions; First Derivative Test for local extrema
  - Relation between second derivative and concavity; using the second derivative to determine inflection points; Second Derivative Test for local extrema
  - Using the first and second derivatives to graph functions
  - Optimization problems
  - Rolle's Theorem and the Mean Value Theorem for derivatives
  - Antiderivatives; the indefinite integral
  - Motion problems (position/velocity/acceleration)

- Chapter 5 (Integration)
  - Approximating areas under curves using Riemann sums
  - Definition of the definite integral as a limit of Riemann sums; basic integration rules
  - Fundamental Theorem of Calculus (both versions)
  - Using the FTC to calculate areas under curves; integrating even and odd functions
  - Integration by substitution

Homework: A homework assignment will be given over each section after it is covered in lecture. The assignments are accessible via Canvas. The assignments will be collected and graded. Each will typically be due two class periods after it has been posted on Canvas. You are allowed and even encouraged to discuss the assignments with each other, but the work that you hand in must be your own.

Exams: We will have a midterm exam and a final exam. The midterm is scheduled for Tuesday, June 19 during regular class time. The final exam is scheduled for Thursday, July 5 during regular class time.

Grading scheme: Your homework average constitutes 40% of your overall course average. The midterm exam is worth 25%, and the final is worth 35%.

Note: Class will not meet on Independence Day (Wednesday, July 4).