

# Syllabus

## Math 4910-A, Summer 2007

**Course Title:** Conceptual Calculus I

**Credits:** 3 semester

**Prerequisites:** A (mathematical) Pulse (including a foundation in algebra, geometry, and trigonometry although specific topics within these fields will be reviewed as needed)

**Textbook:** Calculus Concepts and Contexts (3<sup>rd</sup> ed.) by James Stewart

### Meeting

**Schedule:** Tuesdays & Thursdays (May 15 - June 28), 7:30-10:30 p.m. at your distance delivery site (class originates from USU's Logan Campus, Engr 401)

**Instructor:** Eric Rowley

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(sorely out of date)

Office Hours: By appointment

**Student Teaching Assistants:**

Brent Thomas

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Rebecca Peterson

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**Students** (more like colleagues, really):

This course is mostly populated by, but not restricted to, public school teachers seeking to upgrade their math-teaching endorsement levels by participation in the UMEP program.

Further information about UMEP can be found at [umep.usu.edu](http://umep.usu.edu).

### Course Goals:

The principal course goal is for you to have a meaningful learning experience as you interact with the course content. Pragmatically speaking the goal is for you to accomplish a calculus course requirement and/or provide you with the necessary prerequisite skills and knowledge to participate in subsequent courses.

### Course Content:

The content of Math 2910 is organized into overlapping sections outlined at the end of this document. You will interact with this content by constructing concepts, discovering relationships, comprehending vocabulary and notation, developing algorithmic skills, memorizing basic facts, and applying knowledge and skills to real, contrived, and mathematical situations, etc.



**Classroom Procedures:**

Attendance and participation are welcomed, crucial, and expected. Comments, questions, interruptions, etc. are encouraged

Much of the out of class communication and course management/administrative handling will be done on BlackBoard Vista. If you need help with any facet of BlackBoard Vista, contact Brent at [brentthomas@cc.usu.edu](mailto:brentthomas@cc.usu.edu) .

**Homework, Quizzes, Tests, Grades, etc.:**

You should keep a journal. Your journal should include, but is not limited to, individual sections for each of the following:

- Class meeting agendas & notes (keep these together in one section or separate them into two sections, as you wish)
- Homework
- Collection of basic non-trigonometric functions and two-variable equations
- Summary of Trigonometry
- Major/fundamental definitions
- Major/fundamental theorems
- Basic derivative formulas
- Applications of derivatives
- Summary of methods for evaluating definite integrals
- Summary of indefinite integral formulas and strategies
- Applications of integrals
- Anything else you feel is journal worthy (whatever helps you to organize, retain, and retrieve information)
- final essay (course- and self-evaluation)

Homework will be assigned at each class meeting. Based on your stature as professionals, it is assumed the assignments will be completed thoroughly, accurately, neatly/organized, and on time. Assignments may be submitted to your assigned TA by fax (435-797-1822) or email.

With sufficient notice, Tests, quizzes, etc. will be given at the instructor's discretion.

Your final grade will be based/justified in equal parts by your journal, homework, test and quiz scores.

**Americans with Disabilities Act:**

Title II of the Americans with Disabilities Act mandates that all state and local government programs be administered in such manner as to protect qualified individuals with disabilities from discriminatory treatment. Utah State University complies with this policy, and therefore:

If you need accommodations because of special exceptionalities, please meet with Eric during the first week of the semester to make arrangements. Accommodations including alternative format print materials (e.g., larger print,

audio, diskette, Braille, etc.) are available through the Disability Resource Center, located in Taggart Student Center room 104, phone number (435)797-2444.

### **Content Outline:**

- I. Review of select topics in Algebra and Geometry (interspersed throughout the course as needed beginning with a treatment of functions)
- II. Trigonometry
  - A. Right Triangles
    1. The Pythagorean Theorem
    2. Ratios of side lengths
      - a. Triangle definitions of basic trigonometric functions
  - B. The Unit Circle
    1. Construction & Labeling of certain angles and points
  - C. General definitions of basic trigonometric functions
  - D. Graphs
  - E. Identities
- III. Limits (in general and of real-valued functions in particular) and Continuity
  - A. General notion of limits in various contexts
  - B. Limit of a function at a “point”
    1. Definitions, vocabulary, and notation
    2. One-sided limits
    3. Computing limits
      - a. Laws, properties, and theorems
    4. Applications
      - a. The entirety of calculus (not that we will accomplish all of this)
      - b. Curve sketching—vertical asymptotes
  - C. Continuity at a “point”
    1. Definitions and vocabulary
    2. Determination of the existence or non-existence of continuity
      - a. Laws, properties, and theorems
    3. Applications
      - a. Underpinnings of many important results throughout calculus
      - b. The Intermediate Value Theorem
      - c. The Extreme Value Theorem
      - d. Curve sketching—general “connectedness” of graphs
        - i. Locating intercepts
  - D. Continuity on intervals
  - E. Limits at infinity
    1. Definitions, vocabulary, and notation
    2. Computation
      - a. Laws, properties, and theorems
    3. Applications
      - a. Curve Sketching—end behavior
- IV. Derivatives
  - A. Notions of average and instantaneous rates of change in various contexts

- B. Derivative of a function at a “point”
    - 1. Definitions, vocabulary, and notation
    - 2. Computation (by directly applying a definition)
    - 3. Applications
      - a. Instantaneous rate of change in various contexts
      - b. Curve sketching—slope
  - C. Derivative functions
    - 1. Definitions, vocabulary, and notation
    - 2. Relationship between differentiability and continuity
    - 3. Computation
      - a. Basic laws, properties, and theorems
      - b. Derivative functions of polynomial, exponential, logarithmic, and trigonometric functions
      - c. Product and Quotient Rules
      - d. Chain Rule
    - 4. Applications
      - a. Instantaneous rates of change in various contexts
      - b. Optimization
      - c. Curve sketching—slope (increasing/decreasing, relative maximums and minimums, etc.)
      - d. The Mean Value Theorem
      - e. Linear approximations
- V. Integration
- A. Riemann sum approximations in various contexts
  - B. Definite integrals
    - 1. Definition, vocabulary, and notation
    - 2. Computation
      - a. Geometric
      - b. Laws, properties, and theorems
      - c. The Fundamental Theorem of Calculus
      - d. Techniques of integration (substitution, parts, partial fractions)
      - e. Integral tables and technology
    - 3. Applications
      - a. Geometric (length, area, volume, average value)
      - b. Physical (force, work, mass, moments, etc.)
      - c. Total change in various contexts
- VI. Various and Sundry Topics (as time allows)
- A. Limits involving infinity
    - 1. L’Hospital’s Rule
    - 2. Improper integrals
  - B. Implicit differentiation
    - 1. related rates
    - 2. derivatives of inverse functions
  - C. Approximation
    - 1. Linear approximations and differentials
    - 2. Newton’s Method

- 3. Numerical integration methods
- D. Additional integration techniques
  - 1. Trigonometric substitution
  - 2. Partial fractions on steroids
- E. Additional applications of derivatives and integrals
- F. Parametric equations

Note: There is too much here to cover adequately in a course of this nature. We will pick and choose topics as we go along and see where our journey takes us. Additional topics may be added at the instructor's discretion.