Lecture-Free Calculus for Science and Engineering

COURSE NUMBER: MA 16100 - 5 Credits

COURSE TITLE: Plane Analytic Geometry & Calculus I

INSTRUCTORS: Christina Alvey, Natalie Gustafson, Elizabeth Kersey, James McClure, Joseph Ruan, Gabriel Sosa, Matthew Weaver, Benjamin Wiles, Arnold Yim

COURSE LEARNING OBJECTIVES:

1. An ability to compute limits and to apply limit laws
2. An ability to apply rules of differentiation to compute derivatives of elementary functions
3. An ability to sketch graphs of functions with the aid of differentiation techniques
4. An ability to find maxima and minima of functions and apply this ability to optimization problems
5. An ability to compute integrals of some elementary functions and to apply the Fundamental Theorem of Calculus to compute areas of certain planar regions

$$\frac{d}{dx}\int_a^x f(t)dt = f(x)$$

Motivation & Objectives

MA 16100 is a historically difficult course required for engineering and science majors.

1. To address needs of students that are not being met in the traditional configuration.
2. To provide an environment that fosters collaborative learning and active engagement with the subject matter.
3. To foster a community of learners.
4. To modernize and optimize the use of resources.
5. To increase student accountability for learning while providing the necessary supports for them to be successful
6. To improve academic outcomes including ways that contribute to personal growth and long-term student success

Initial Observations

1. The classroom environment is more engaging and collaborative than the traditional format.
2. Attendance is markedly higher than for the traditional sections.
3. Standardized assessments indicate the experimental section maintains or exceeds the academic outcomes of the traditional version.
4. Students' mathematical communication skills show improvement.