Calculus: Single Variable

University of Pennsylvania

STUDENT NAME

Matthew Kramer

GRADE

92.4075835555556%

COMPLETION DATE

April 15th 2013

COURSE DETAILS

Instructor: Robert Ghrist

Duration of course: 13 weeks

Time commitment: 8-10 hours/week

Description:
This course provides a brisk, entertaining treatment of differential and integral calculus, with an emphasis on conceptual understanding and applications to the engineering, physical, and social sciences.

Syllabus: The course is divided into five "chapters":

CHAPTER 1: Functions
After a brief review of the basics, we will dive into Taylor series as a way of working with and approximating complicated functions. The chapter will use a series-based approach to understanding limits and asymptotics.

CHAPTER 2: Differentiation
Though you already know how to differentiate some functions, you may not know what differentiation means. This chapter will emphasize conceptual understanding and applications of derivatives.

CHAPTER 3: Integration
We will use the indefinite integral (an anti-derivative) as a motivation to look at differential equations in applications ranging from population models to linguistics to coupled oscillators. Techniques of integration up to and including computer-assisted methods will lead to Riemann sums and the definite integral.

CHAPTER 4: Applications
We will get busy in this chapter with applications of the definite integral to problems in geometry, physics, economics, biology, probability, and more. You will learn how to solve a wide array of problems using a consistent conceptual approach.

CHAPTER 5: Discretization
Having covered Calculus for functions with a single real input and a single real output, we turn to functions with a *discrete* input and a real output: sequences. We will re-develop all of Calculus (limits, derivatives, integrals, differential equations) in this new context, and return to the beginning of the course with a deeper consideration of Taylor series.

A more detailed lecture-by-lecture syllabus can be found here.

Prof. Robert W. Ghrist
Andrea Mitchell PIK University
Professor Departments of Mathematics
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