COURSE OUTLINE: Calculus 12, Year 2016-2017

Instructor:
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Course Description:
Calculus 12 is a course that builds on the knowledge gained in Pre-Calculus 12 and prepares students for post-secondary mathematics. This course will assist students to develop the ability to conjecture, reason logically, employ quantitative and spatial information, and apply a variety of mathematical methods to solve problems and make decisions confidently and independently. Students will work collaboratively to problem solve and reflect on their mathematical processes to effectively communicate their understanding. Students will be required to learn one topic on their own. Students taking this course will not receive credit for first-term calculus at a post-secondary institute.

Course Objective:
- develop a positive attitude towards the continued learning of mathematics
- appreciate the usefulness, power, and beauty of mathematics, and recognize its relationship with other disciplines and with everyday life
- gain knowledge and understanding of mathematical concepts
- develop mathematical skills and apply them
- develop the ability to communicate mathematics with appropriate symbols and language
- develop the ability to reflect upon and evaluate the significance of their work and the work of others
- develop patience and persistence when solving problems
- develop and apply information and communication technology skills in the study of mathematics

At the end of the course the student should be able to:
- use a variety of methods to solve real-life, practical, technical, and theoretical problems.
- use a scientific calculator or a computer to solve problems.
- generalize, design, and justify mathematical procedures using appropriate patterns, models, and technology.
  use spatial problem solving in building, describing, and analyzing.
- verify the reasonableness of an answer.
- communicate their solutions.
- understand and write short proofs.

Course Content:
- Finding Limits Graphically and Numerically

- Evaluating Limits Analytically
- Continuity and One-Sided Limits
- Infinite Limits
- The Derivative and the Tangent Line Problem
- Basic Differentiation Rules and Rates of Change
- Product and Quotient Rules and Higher-Order Derivatives
- The Chain Rule
- Implicit Differentiation
- Related Rates
- Extrema on an Interval
- Rolle's Theorem and the Mean Value Theorem
- Increasing and Decreasing Functions and the First Derivative Test
- Concavity and the Second Derivative Test
- Limits at Infinity
- Summary of Curve Sketching
- Optimization Problems
- Newton's Method
- Differentials
- Antiderivatives and Indefinite Integration
- Area
- Riemann Sums and Definite Integrals
- The Fundamental Theorem of Calculus
- Integration by Substitution
- Numerical Integration
- Natural Logarithmic Function: Differentiation
- Natural Logarithmic Function: Integration
- Inverse Functions
- Exponential Functions: Differentiation and Integration
- Bases Other Than *e* and Applications
- Slope Fields and Euler's Method
- Differential Equations: Growth and Decal
- Separation of Variables and the Logistic Equation
- Area of a Region Between Two Curves
- Volume: The Disk Method
- Volume: The Shell Method
- Arc Length and Surfaces of Revolution
- Work
- Basic Integration Rules
- Integration by Parts
- Partial Fractions
- Indeterminate Forms and L'Hopital's Rules

- Improper Integrals
- Other topics may be added (time permitting)

Some topics may be moved into different terms based on how quickly or slowly the class is able to grasp the concepts.

Assessment:
- Assessment will be based on chapter tests (60%) and homework (20%).
- The final exam will be worth 20%.
- Marks will be computed on a percentage basis.
- Students may earn bonus marks through presentations or extra work.

**Cheating on a quiz or test, and plagiarism on an assignment or project, will result in zero credit, a possible downgrade of the term letter grade, and a notation in the student's file. Both the lender and the borrower will share in the consequences.

Classroom resources:
Finney, Demana, Waits, and Kennedy. Calculus – Graphical, Numerical, Algebraic. Addison Wesley Longman, 1999.

Resource Materials to be supplied by students:
- Ring binder with ample supply of paper
- Pencils, erasers, colored markers
- Graphing calculator (must be TI-83/84 Plus or Casio fx-9750/9860g in order to receive help)