Madison High School
Northeast Community College
Course Syllabus
2016-2017 School Year

MATH 1600 Analytic Geometry and Calculus

- **CATALOG DESCRIPTION:**

  COURSE NUMBER: MATH 1600

  COURSE TITLE: Analytic Geometry and Calculus I

  PRE-REQUISITES: Trigonometry/PreCalculus with a grade of "C" or better, or appropriate test score

  CO-REQUISITES: None

  DESCRIPTION:
  This course is a study of analytical geometry and single variable calculus. Topics include limits, continuity, derivatives, applications of derivatives, integrals, and applications of integrals.

  CREDIT: 5

- **COURSE OBJECTIVES:**

  Course will:

- Present analytical, numerical and graphical techniques to establish limits.
- Introduce analytical, numerical and graphical techniques to verify continuity
- Teach derivatives using the definition of derivative
- Provide the rules of differentiation to calculate derivatives
- Relate the concepts of differentiation to analyze increasing and decreasing

functions and determine concavity.
- Use the concepts of differentiation to calculate rates of change.
- Present model functions and use techniques of differentiation to optimize the function.
- Teach integrals using the definition of integrals and approximation.
- Provide the rules of integration to calculate integrals.
- Relate the concepts of integration to calculate area between curves.
- Use the concepts of integration to calculate volumes of solids.

This course fulfills a General Education requirement in Mathematics for the AA/AS degree(s). One goal of the course will be to practice and develop critical thinking/ problem solving skills. In part, this will be modeled during class discussions and/or problem-solving activities. Students will use critical and creative thinking to arrive at reasoned conclusions using methods of quantitative reasoning, scientific inquiry and comparative thought. They will apply and evaluate knowledge, concepts, information, experience, theories and techniques to draw conclusions, arrive at solutions, select a course of action, or engage in artistic expression. Progress in this area will be assessed with the following graded assignment(s): embedded in exam questions

III. STUDENT LEARNING OUTCOMES:

Limits and Continuity

Outcomes: The student will:

- Evaluate rates of change
- Formulate tangents to curves
- Calculate limits of a function using the limit laws
  - Use the precise definition of a limit
  - Evaluate one-sided limits and limits at infinity
- Evaluate infinite limits and vertical asymptotes
- Verify continuity of functions
  - Evaluate tangents and derivatives

Derivatives

Outcomes: The student will:

- Find tangents and derivatives at a point
- Express the derivative as a function
- Utilize differentiation rules for polynomials, products, and quotients
- Interpret the derivative as a rate of change
- Find the derivatives of trigonometric functions
- Utilize the chain rule and parametric equations
- Use implicit differentiation
- Evaluate inverse trigonometric functions
- Find the derivatives of invers functions (including inverse trig functions), logarithms and hyperbolic functions
- Solve related rates problems

- Utilize linearization and differentials

Applications of Derivatives

Outcomes: The student will:

                Evaluate extreme values of functions
- Utilize the mean value theorem
- Solve related rates problems
- Use the first derivative test
                        Utilize the second derivative test to determine concavity and sketch curves
- Solve applied optimization problems
- Examine indeterminate forms and evaluate using L'Hopital's Rule
- Utilize Newton's Method
- Evaluate antiderivatives

Integrals

Outcomes: The student will:

            Estimate with finite sums
            Use sigma notation and limits of finite sums
            Evaluate definite integrals
            Utilize the fundamental theorem of calculus
            Evaluate indefinite integrals
- Use the substitution rule
- Find the area under a curve and between curves

Applications of Definite Integrals

Outcomes: The student will:

            Determine volumes by slicing and rotation about an axis
            Evaluate volumes by cylindrical shells

- **CONTENT/TOPICAL OUTLINE:**

  - Limits and Continuity

- Rates of change

- Limits of functions

- Continuity

- Derivatives
- Derivative at a point
- Derivative as a function
- Differentiation Rules
- Derivative as Rate of Change
- Derivatives of Trigonometric Functions
- Chain Rule
- Implicit Differentiation
- Derivatives of Inverse Functions and Logarithms
- Inverse Trigonometric Functions
- Related Rates
- Linearization and Differentials

- Applications of Derivatives
- Extreme values of functions
- Mean value theorem
- First Derivative Test
- Concavity
- L'Hopital's Rule
- Applied Optimization
- Newton's Method
- Antiderivatives

- Integrals
- Finite sums
- Definite integral
- Fundamental Theorem of Calculus
- Indefinite Integrals
- Area between curves

- Applications of Definite Integrals
- Volumes using cross-sections
- Volumes using cylindrical shells

IV. **INSTURCTIONAL MATERIALS:**

Required Text: Calculus of a Single Variable, AP Edition; 9th
Larson, Edwards, Brooks/Cole, Cengage Learning, 2010, ISBN
978-0-547-21290-6

V.   METHOD OF PRESENTATION:

Instruction: Students in this course will learn through reading the text, interactive lecture, discussion, group work and individualized instruction.

Resources: Students may find they need extra assistance to understand the material presented in this course, here are additional resources available:

- A Students Solutions Manual is available in my room that you may use when working in my room.
- Extra help can be given before or after school.

VI.   METHOD OF EVALUATION:

Students will be evaluated on the basis of: Homework/Homework Quizzes – 15%, quizzes – 35% and Tests – 50%. The grading scale that will be used is found in the student handbook.

A	94 – 100%
B+	92 – 93%
B	86 – 91%
C+	84 - 85%
C	78 – 83%
D+	76 – 77%
D	70 – 75%
F	69% and below

VII.   COURSE REQUIREMENTS:

- Class attendance is **MANDATORY.** When a student misses a class, the STUDENT is responsible for all the material presented in class and assignments for that day. The student will be expected to come to the next class prepared with all assignments complete.
- The homework will be problems from the book. I recommend that you keep all your homework organized in a 3-ring binder along with your notes.
- Student will be given unit exams, quizzes and a final exam.
- I hold academic honesty in highest regard. Any student caught cheating on a test or assignment will receive a zero for that item.
- **ASK QUESTIONS!**

VIII. INSTRUCTOR NAME AND CONTACT INFORMATION:

- **Instructor**: Dana Brandl
- **Email**: dbrandl@mpsdragons.org
- **Office Hours:** Before or after school

* * I am available to answer questions any time during office hours.

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