

CALCULUS HONORS

Prerequisite: B or better in Advanced Mathematics or recommendation of teacher

Meeting time: 5 days a week, full-year, one credit

Placement: Grade 12, Level II

This course is intended for students who have acquired a thorough mastery of algebra, geometry and trigonometry. The course begins with a review of necessary Pre-Calculus topics, and then proceeds through the concepts of functions and limits. From this, the concepts of differentiation and integration are developed with heavy emphasis placed upon the applications of differentiation in solving problems.

(Agawam High School Academic Expectations: 1, 3, 4, 5, 6, 10)

COURSE GOALS AND OBJECTIVES

1. To produce in the students a comprehensive understanding of the concept of the derivative of a continuous function.
2. To develop the student's ability to apply the concept of differentiation in solving problems involving technical situations.
3. To convey to the student an understanding of the concept of integration.
4. To develop a thorough knowledge of the behavior of functions.
5. To convey to the student an understanding of the concept of a limit.
6. To generate in the student a recognition of and an appreciation for the beauty inherent in the logical structure of the calculus.
7. To make the student sufficiently proficient in calculus so that he/she can successfully matriculate in a freshman second semester college calculus course.

COURSE OUTLINE

B. Analytic Geometry Introduction

1. Slope of a straight line
2. Equation of a straight line
3. Equations of perpendicular lines
4. Distance from a point (not on the given line) to a given straight line
5. Open and closed interval or neighborhoods

C. Functions

1. Definition
3. Types of more than one variable
4. Combinations of two or more functions
 - a. Sum
 - b. Product
 - c. Quotient

D. Limits

1. Definition
2. Limit of slopes of a curve
3. Statements and proofs of theorems on limits
 - a. Sum
 - b. Product
 - c. Quotient
4. Evaluation of limits
 - a. Infinity
 - b. Zero
 - c. Other real numbers

E. Continuity

1. Definition of a continuous function
2. Right and left hand limits and continuity
3. Points of discontinuity in otherwise continuous functions

F. Derivative of a Function

1. Definition
2. Determination of derivatives by long method
3. Correlation of rate of change with derivative
4. Formulas for calculation of derivatives
5. Chain Rule
6. Derivatives of inverse functions
7. Derivatives of implicit functions
8. Calculation of higher derivatives
9. Derivatives of composite functions

G. Differentials

1. Definition of dx and dy
2. Calculation
3. Use in finding approximations

H. Applications of the Derivative

1. Tangents to curves
2. Increasing and decreasing functions and concavity
3. Points of inflection
4. Related rate problems (time-rate)
5. Second derivative test for concavity of curves
6. Determining maxima and minima by means of derivatives
7. Solving maxima and minima verbal problems
8. Rolle's Theorem
9. Mean Value Theorem
10. Extension of the Mean Value Theorem
11. Derivatives of trigonometric functions

I. Integration

1. Indefinite integral
 - a. Definition
 - b. General formula
2. Definite integral
 - a. Definition
 - b. Applications
3. Integration of trigonometric functions
4. Determination of areas trapped between curves in a plane

J. Fundamental Theorem of Integral Calculus

1. Explanation of Theorem
2. Use of trapezoidal technique for approximating an integral

RESOURCES

Primary Textbook:

Strauss, Monty J., Bradley, Gerald L. and Smith, Karl J. Calculus,
3rd Edition. Upper Saddle River, New Jersey; Prentice-Hall, Inc., 2002.

ASSESSMENT STRATEGIES

- Class participation, written and oral communication
- Class work
- Homework
- Class projects and presentations
- Notebooks/Portfolios
- Quizzes
- Tests
- Semester Exams
- School Wide and Departmental Rubrics