

PETERS TOWNSHIP SCHOOL DISTRICT

CORE BODY OF KNOWLEDGE

AP CALCULUS BC

GRADES 10-12

For each of the sections that follow, students may be required to understand, apply, analyze, evaluate or create the particular concepts being taught.

COURSE DESCRIPTION:

This course is a study of the language, concepts, and techniques of Calculus (Calculus I and Calculus II) that will prepare students to approach and solve problems following a logical succession of steps. This course is the foundation for college mathematics courses. Topics include the study of limits, derivatives, and integrals of functions (polynomial, exponential, logarithmic, rational, radical, and trigonometric), Real world applications are presented within the course content and a function's approach is emphasized.

STUDY SKILLS:

- Maintain an organized math binder
- Adequately prepare for quizzes and exams through the development of study skills
- Independent practice
- Prepare for the AP Calculus BC Exam

UNIT THEMES

1. LIMITS

- calculate limits using algebra
- estimate limits from graphs or tables of data
- apply the use of a graphic utility to evaluate limits
- identify the nonexistence of limits

2. ASYMPTOTIC AND UNBOUNDED BEHAVIOR

- understand asymptotes in terms of graphical behavior
- describe asymptotic behavior in terms of limits involving infinity

3. CONTINUITY:

- define and apply Intermediate Value Theorem

4. DERIVATIVE:

- define derivative
- relate differentiability and continuity
- apply derivative to determine equation of tangent line at a point
- determine instantaneous rate of change as the limit of average rate of change
- approximate rate of change from graphs and tables of values Model real-world data

5. SECOND DERIVATIVES:

- compare characteristics of the graphs of f and its first and second derivative
- relate the concavity of f and the sign of the second derivative
- analyze and interpret points of inflection as places where concavity changes

6. APPLICATIONS OF DERIVATIVES:

- use and apply first derivative test, second derivative test, concavity, and inflection
- analyze and interpret all concepts graphically
- analyze planar curves given in parametric form, polar form, and vector form
- understand the geometric interpretation of differential equations via slope fields and the relationship between slope fields and derivatives of implicitly defined functions
- determine numerical solution of differential equations using Euler's method
- apply L'Hopital's Rule and its use in determining convergence of improper integrals and series

7. COMPUTATION OF DERIVATIVES:

- determine derivative of parametric, polar, and vector functions
- differentiate algebraic functions by using the basic rules including exponential, logarithmic, trigonometric, and inverse trigonometric functions

INTEGRALS

8. DEFINITE INTEGRALS:

- define integrals and apply to basic formulas
- adapt knowledge and techniques to solve application to model physical, social, or economic situations
- apply the integral of a rate of change to setting up an approximating Riemann sum and represent its limit as a definite integral
- apply the Fundamental Theorem to evaluate definite integrals and provide a graphical analysis of functions so defined
- determine antiderivatives by substitution of variables (including change of limits), parts, and simple partial fractions (nonrepeating linear factors only)
- evaluate improper integrals (as limits of definite integrals)
- calculate volume of a solid of revolution including disc, washer, and shell method.

POLYNOMIAL APPROXIMATIONS AND SERIES

- define series as a sequence of partial sums, and convergence is defined as the limit of the sequence of partial sums
- apply series of constants (including motivating examples with decimal expansion)
- apply geometric series, harmonic series, alternating series, terms of series, and its use in testing the convergence of p-series
- apply Taylor polynomial approximation with graphical demonstration of convergence
- apply the general Taylor series centered at $x = a$
- apply Maclaurin series for the functions
- manipulate Taylor series and shortcuts to computing Taylor series, including differentiation, antidifferentiation, and the formation of new series from known series
- apply defined power series and radius of convergence

MATERIALS

Calculus of a Single Variable, Eighth Edition,

- Chapter Resources Book
- Calculus Lab Activities
- Graphing Calculator
- Kuta-Software Worksheet Generator
- CalcChat.com (Homework Help)
- Fast track to a Five (workbook)

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