

Warren County School District

PLANNED INSTRUCTION

COURSE DESCRIPTION

Course Title: _____ ~~Pre-Calculus~~ **Calculus** _____

Course Number: _____ **00290** _____

Course Description and Prerequisites: **Calculus** is intended for students who have completed Functions or Functions Honors and need more preparation for college level calculus. It consists of roots and graphs of polynomial functions, a brief review of trigonometry, and one-half year of differential calculus. An average of 75% earned in Functions or 70% in Functions Honors is recommended.

Suggested Grade Level: _____ **12** _____

Length of Course: ____ One Semester ____ **X** Two Semesters ____ Other
(Describe) _____

Units of Credit: _____ **1** _____ (Insert **NONE** if appropriate.)

PDE Certification and Staffing Policies and Guidelines (CSPG) Required
Teacher Certification(s) _____ **Mathematics 50** _____

Certification verified by WCSD Human Resources Department:
____ **X** ____ Yes ____ No

Board Approved Textbooks, Software, Materials:

Title: **Calculus w/Analytic Geometry 8th ed.**

Publisher: McDougal Little

ISBN #: 0 618 794344

Copyright Date: 2006

Date of WCSD Board Approval: November 13, 2006

Title: Pre-Calculus: Functions and Graphs 5th ed.

Publisher: Glenco

ISBN #: 0 07 26871-3

Copyright Date:

Date of WCSD Board Approval: November 13, 2006

BOARD APPROVAL:

Date Written: 2006-2007

Date Approved: May 14, 2007

Implementation Year: 2007-2008

Suggested Supplemental Materials: TI 89 or equivalent calculator

Course Standards

PA Academic Standards:

2.1.11 Numbers, Number Systems and Number Relations
2.2.11 Computation and Estimation
2.4.11 Mathematical Reasoning and Connections
2.5.11 Mathematical Problem Solving and Communication
2.6.11 Statistics and Data Analysis
2.8.11 Algebra and Functions
2.9.11 Geometry
2.10.11 Trigonometry
2.11.11 Concepts of Calculus

1.2.11 Reading Critically in All Content Areas

WCSD Academic Standards: None

Industry or Other Standards: Must use College Board approved syllabus.

WCSD EXPECTATIONS

WCSD K-12 Expectations for instruction in writing, reading, mathematics and, technology have been developed and revised annually. The teacher will integrate all WCSD Expectations into this planned instruction

SPECIAL EDUCATION AND GIFTED REQUIREMENTS

The teacher shall make appropriate modifications to instruction and assessment based on a student's Individual Education Plan (I.E.P.) or Gifted Individual Education Plan (G.I.E.P.).

**SPECIFIC EDUCATIONAL OBJECTIVES/CORRESPONDING STANDARDS
AND ELIGIBLE CONTENT WHERE APPLICABLE**
(List Objectives, PA Standards #'s, Other Standards (see samples at end))

Specific Educational Objectives to be Taught:

I. Functions, Graphs, and Limits

A. Analysis of graphs

- With the aid of technology, graphs of functions are often easy to produce.
- To predict and to explain the observed local and global behavior of a function.

B. Limits of functions

- An intuitive understanding of the limiting process.
- Calculating limits using algebra.
- Estimating limits from graphs or tables of data.

C. Asymptotic and unbounded behavior

- Understanding asymptotes in terms of graphical behavior.
- Describing asymptotic behavior in terms of limits involving infinity.
- Comparing relative magnitudes of functions and their rates of change. (For example, contrasting exponential growth, polynomial growth, and logarithmic growth.)

D. Continuity as a property of functions

- An intuitive understanding of continuity. (Close values of the domain lead to close values of the range.)
- Understanding continuity in terms of limits.
- Geometric understanding of graphs of continuous functions. (Intermediate Value Theorem and Extreme Value Theorem)

II. Derivatives

A. Concept of the derivative

- Derivative presented geometrically, numerically, and analytically.
- Derivative interpreted as an instantaneous rate of change.
- Derivative defined as the limit of the difference quotient.
- Relationship between differentiability and continuity.

B. Derivative at a point

- Slope of a curve at a point. Examples are emphasized, including points at which there are vertical tangents and points at which there are no tangents.
- Tangent line to a curve at a point and local linear approximation.
- Instantaneous rate of change as the limit of average rate of change.
- Approximate rate of change from graphs and tables of values.

C. Derivative as a function

- Corresponding characteristics of graphs of f and f' .
- Relationship between the increasing and decreasing behavior of f and the sign of f' .
- The Mean Value Theorem and its geometric consequences.
- Equations involving derivatives. Verbal descriptions are translated into equations involving derivatives and vice versa.

D. Second derivatives

- Corresponding characteristics of the graphs of f , f' , and f'' .
- Relationship between the concavity of f and the sign of f'' .
- Points of inflection as places where concavity changes.

E. Applications of derivatives

- Analysis of curves, including the notions of monotonicity and concavity.
- Optimization, both absolute (global) and relative (local) extrema.

- Modeling rates of change, including related rates problems.
 - Use of implicit differentiation to find the derivative of an inverse function.
 - Interpretation of the derivative as a rate of change in varied applied contexts, including velocity, speed, and acceleration.
- F. Computation of derivatives
- Knowledge of derivatives of basic functions, including power, exponential, logarithmic, trigonometric, and inverse trigonometric functions.
 - Basic rules for the derivative of sums, product, and quotients of functions;
 - Chain rule and implicit differentiation.

ASSESSMENTS

PSSA Assessment Anchors Addressed: The teacher must be knowledgeable of the PDE Assessment Anchors and/or Eligible Content and incorporate them into this planned instruction. Current assessment anchors can be found at pde@state.pa.us.

Formative Assessments: The teacher will develop and use standards-based assessments throughout the course.

Portfolio Assessment: ____ Yes X No

District-wide Final Examination Required: X Yes ____ No

Course Challenge Assessment: Course challenge assessment will be based on activities and exams that measure student proficiency as the course standards at 84%.

REQUIRED COURSE SEQUENCE AND TIMELINE

(Content must be tied to objectives)

Outline of Content Sequence and Recommended Time:

I. Functions, Graphs, and Limits	<u>DAYS</u>
A. Analysis of graphs	18
B. Limits of functions	18
C. Asymptotic and unbounded behavior	18
D. Continuity as a property of functions	18
II. Derivatives	
A. Concept of the derivative	18
B. Derivative at a point	18
C. Derivative as a function	18
D. Second derivatives	18
E. Applications of derivatives	18
F. Computation of derivatives	18

WRITING TEAM: Math Teachers

WCSD STUDENT DATA SYSTEM INFORMATION

1. Is there a required final examination? ☒ Yes ☐ No
2. Does this course issue a mark/grade for the report card?
☒ Yes ☐ No
3. Does this course issue a Pass/Fail mark? ☐ Yes ☒ No
4. Is the course mark/grade part of the GPA calculation?
☒ Yes ☐ No
5. Is the course eligible for Honor Roll calculation? ☒ Yes ☐ No
6. What is the academic weight of the course?
☐ No weight/Non credit ☒ Standard weight
☐ Enhanced weight (Describe) _____

No