

# ILLINOIS VALLEY COMMUNITY COLLEGE



## Course Syllabus

**DIVISION:** English, Mathematics, Education

**Course:** MTH 1007 – Calculus for Business  
and Social Sciences

Date: November 15, 2006

Semester Hours: 4

Prerequisite(s): 1) Mth 1003 with a grade of "C" or better or the equivalent college course; 2) An appropriate score on the placement test.

Delivery Method:

<input checked="" type="checkbox"/> Lecture	4 Credit Hours
<input type="checkbox"/> Seminar	0 Credit Hours
<input type="checkbox"/> Lab	0 Credit Hours
<input type="checkbox"/> Clinical	0 Credit Hours
<input type="checkbox"/> Online	
<input type="checkbox"/> Blended	

Offered:  Fall  Spring  Summer

IAI Equivalent –**Only for Transfer Courses**–go to <http://www.itransfer.org>: M1900

### CATALOG DESCRIPTION:

This course is for students who need a basic understanding of differential and integral calculus, but do not need the more rigorous traditional calculus sequence. Applications in the fields of business and social sciences are stressed.

## GENERAL EDUCATION GOALS ADDRESSED

*[See the last page of this form for more information.]*

### Upon completion of the course, the student will be able:

[Choose those goals that apply to this course. ]

- To apply analytical and problem solving skills to personal, social and professional issues and situations.
- To communicate orally and in writing, socially and interpersonally.
- To develop an awareness of the contributions made to civilization by the diverse cultures of the world.
- To understand and use contemporary technology effectively and to understand its impact on the individual and society.
- To work and study effectively both individually and in collaboration with others.
- To understand what it means to act ethically and responsibly as an individual in one's career and as a member of society.
- To develop and maintain a healthy lifestyle physically, mentally, and spiritually.
- To appreciate the ongoing values of learning, self-improvement, and career planning.

## EXPECTED LEARNING OUTCOMES AND RELATED COMPETENCIES:

*[Outcomes related to course specific goals.]*

### Upon completion of the course, the student will be able to:

1. Students will demonstrate knowledge of the cartesian coordinate system.
  - 1.1. Students will be able to solve inequalities
  - 1.2. Students will be able to evaluate expressions
  - 1.3. Students will be able to perform indicated operations
  - 1.4. Students will be able to factor the expressions
  - 1.5. Students will be able to sketch a set of coordinate axes and plot points
  - 1.6. Students will be able to find the distance between points
  - 1.7. Students will be able to find the slope of the given line
  - 1.8. Students will be able to write the equation in slope-intercept form
  - 1.9. Students will be able to find the equation of the line given points
  
2. Students will demonstrate knowledge of functions, limits, and the derivative
  - 2.1. Students will be able to determine whether the point lies on the graph
  - 2.2. Students will be able to find the domain of the function
  - 2.3. Students will be able to sketch the graph of a piece-wise function
  - 2.4. Students will be able to determine is the graph is a function
  - 2.5. Students will be able to find the rules for  $f-g$ ,  $f+g$ ,  $fg$ , and  $f/g$
  - 2.6. Students will be able to find the rules for composite functions
  - 2.7. Students will be able to determine the kind of function given
  - 2.8. Students will be able to find the equilibrium point
  - 2.9. Students will be able to find the indicated limit
  - 2.10. Students will be able to find the indicated one-sided limit
  - 2.11. Students will be able to determine functional values that are discontinuous

- 2.12. Students will be able to show that a function is continuous
- 2.13. Students will be able to prove that  $f$  must have a zero between  $a$  and  $b$
- 2.14. Students will be able to use the four-step process to find slope of tangent
- 2.15. Students will be able to find average rate of change
- 2.16. Students will be able to find the instantaneous rate of change
  
3. Students will demonstrate knowledge of differentiation
  - 3.1. Students will be able to find the derivative using the rules of differentiation
  - 3.2. Students will be able to find the given limit by evaluating the derivative
  - 3.3. Students will be able to find the marginal cost, revenue, and profit
  - 3.4. Students will be able to find the average marginal cost, revenue, and profit
  - 3.5. Students will be able to find the elasticity of demand
  - 3.6. Students will be able to find the second and third derivatives
  - 3.7. Students will be able to find derivatives using implicit differentiation
  - 3.8. Students will be able to find the differential of the given function
  
4. Students will demonstrate knowledge of applications of the derivative
  - 4.1. Students will be able to find increasing, decreasing, or constant functions
  - 4.2. Students will be able to determine the relative maxima and minima
  - 4.3. Students will be able to determine the concavity and inflection points
  - 4.4. Students will be able to find the vertical and horizontal asymptotes
  - 4.5. Students will be able to sketch the graphs using curve-sketching
  - 4.6. Students will be able to determine the absolute maxima and minima
  
5. Students will demonstrate knowledge of exponential and logarithmic functions
  - 5.1. Students will be able to evaluate and simplify expressions with  $\log$  and  $e$
  - 5.2. Students will be able to use the laws of logs to solve equations
  - 5.3. Students will be able to find accumulated amounts and present values
  - 5.4. Students will be able to find the effective rates and annuities
  - 5.5. Students will be able to differentiate exponential functions
  - 5.6. Students will be able to differentiate logarithmic functions
  - 5.7. Students will be able to solve exponential growth problems
  - 5.8. Students will be able to solve exponential decay problems
  - 5.9. Students will be able to solve population problems
  
6. Students will demonstrate knowledge of integration
  - 6.1. Students will be able to verify that  $F$  is an antiderivative of  $f$
  - 6.2. Students will be able to find the indefinite integral
  - 6.3. Students will be able to solve an initial value problem
  - 6.4. Students will be able to find a function given slope at any point
  - 6.5. Students will be able to solve indefinite integrals using substitution
  - 6.6. Students will be able to find an approximation of the area under the curve
  - 6.7. Students will be able to compute the Riemann sum over the interval
  - 6.8. Students will be able to understand the fundamental theorem of calculus
  - 6.9. Students will be able to evaluate the definite integral
  - 6.10. Students will be able to find the area between two curves

- 6.11. Students will be able to find the consumers surplus
- 6.12. Students will be able to find the producers surplus
- 6.13. Students will be able to find the accumulated future value
- 6.14. Students will be able to find the present value of an income stream
- 6.15. Students will be able to find the amount of an annuity
- 6.16. Students will be able to find the present value of an annuity
  
- 7. Students will demonstrate knowledge of additional topics in integration
  - 7.1. Students will be able to evaluate an indefinite integral by integrate by parts
  - 7.2. Students will be able to use the table of integrals to evaluate integrals
  - 7.3. Students will be able to approximate integrals with numerical integration
  - 7.4. Students will be able to find the present value of a perpetuity
  - 7.5. Students will be able to evaluate improper integrals when convergent
  
- 8. Students will demonstrate knowledge of calculus of several variables
  - 8.1. Students will be able to find the domain of functions of several variables
  - 8.2. Students will be able to sketch level curves
  - 8.3. Students will be able to find the first partial derivatives of functions
  - 8.4. Students will be able to find the second order partial derivatives
  - 8.5. Students will be able to find critical points of several variable functions

**COURSE TOPICS AND CONTENT REQUIREMENTS:**

- I. Preliminaries
  - A. Precalculus Review
  - B. The Cartesian Coordinate System
  - C. Straight Lines
  
- II. Functions, Limits, and the Derivative
  - A. Functions and Their Graphs
  - B. The Algebra of Functions
  - C. Functions and Mathematical Models
  - D. Limits
  - E. One-Sided Limits and Continuity
  - F. The Derivative
  
- III. Differentiation
  - A. Basic Rules of Differentiation
  - B. The Product and Quotient Rules
  - C. The Chain Rule
  - D. Marginal Functions in Economics
  - F. Higher-Order Derivatives
  - G. Implicit Differentiation and Related Rates
  - H. Differentials
  
- IV. Applications of the Derivative

- A. Applications of the First Derivative
- B. Applications of the Second Derivative
- C. Curve Sketching
- D. Optimization
  
- V. Exponential and Logarithmic Functions
  - A. Exponential Functions
  - B. Logarithmic Functions
  - C. Compound Interest
  - D. Differentiation of Exponential Functions
  - E. Differentiation of Logarithmic Functions
  - F. Exponential Functions as Mathematical Models
  
- VI. Integration
  - A. Antiderivatives and the Rules of Integration
  - B. Integration by Substitution
  - C. Area and the Definite Integral
  - D. The Fundamental Theorem of Calculus
  - E. Evaluating Definite Integrals
  - F. Area Between Two Curves
  - G. Applications of the Definite Integral to Business and Economics
  
- VII. Additional Topics in Integration
  - A. Integration by Parts
  - B. Integration Using Tables of Integrals
  - C. Numerical Integration
  - D. Improper Integrals
  
- VIII. Calculus of Several Variables
  - A. Functions of Several Variables
  - B. Partial Derivatives
  - C. Maxima and Minima of Functions of Several Variables

**INSTRUCTIONAL METHODS:**

1. Lecture
2. Class Participation
3. Audio-Visual Aids
4. Instructional Quizzes and Exams

**INSTRUCTIONAL MATERIALS:**

1. Calculus for the Managerial, Life, and Social Sciences, Soo Tan, 6th edition, Brooks/Cole 2003.
2. Computer for Demonstration
3. Instructional Video on Derivatives
4. Graphing Calculator for demonstrations

**STUDENT REQUIREMENTS AND METHODS OF EVALUATION:**

1. Homework from text
2. Class participation
3. Tests
4. Quizzes

100-90% A                      89-80% B                      79-70% C      69-60% D      below 60% F

**OTHER REFERENCES**

1. Calculus for the Managerial, Life, and Social Sciences, Soo Tang Tan, 7th edition, Brooks/Cole 2006.

Form Revised: 3/2/05