Las Positas College
3000 Campus Hill Drive
Livermore, CA 94551-7650
(925) 424-1000
(925) 443-0742 (Fax)

Course Outline for MATH 34

CALC FOR BUS AND SOC SCIENCES

Effective: Fall 2011

I. CATALOG DESCRIPTION:
MATH 34 — CALC FOR BUS AND SOC SCIENCES — 5.00 units

Functions and their graphs; limits of functions; differential and integral calculus of algebraic, exponential and logarithmic functions. Applications in business, economics, and social sciences and use of graphing calculators. Partial derivatives and the method of LaGrange multipliers.

5.00 Units Lecture

Prerequisite
MATH 55 - Intermediate Algebra for STEM
with a minimum grade of C
or

MATH 55B - Intermediate Algebra for STEM B
with a minimum grade of C
or

MATH 55Y - Intermediate Algebra
with a minimum grade of C

Grading Methods:
Letter Grade

Discipline:

	MIN
Lecture Hours:	90.00
No Unit Value Lab	18.00
Total Hours:	108.00

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 1

III. PREREQUISITE AND/OR ADVISORY SKILLS:
Before entering the course a student should be able to:

A. MATH55
B. MATH55B
C. MATH55Y

IV. MEASURABLE OBJECTIVES:
Upon completion of this course, the student should be able to:

A. Solve problems using limits;
B. Use a graphing calculator to graph functions;
C. Determine the domain and range of a function;
D. Apply the concepts of continuity, limits and the derivative to graphs;
E. Find the first and second derivatives of algebraic, logarithmic and exponential functions;
F. Use the chain rule to find first derivatives of composites functions;
G. Find and interpret equations of tangents to functions;
H. Apply the concept of the derivative to solve applied optimization and related rate problems in such areas as marginal analysis, consumer behavior and the spread of disease;
I. Find and interpret the anti-derivatives and definite integrals of algebraic and exponential functions;
J. Apply the Fundamental Theorem of Calculus to solve problems involving area and accumulations of sums;
K. Solve basic differential equations and interpret the result;
L. Find partial derivatives of functions of several variables;
M. Use the method of LaGrange multipliers to solve optimization problems involving functions of two variables;
N. Apply the tools of calculus to solve applications in business, economics and the social sciences.

V. CONTENT:

A. Functions
  1. Functional notation
  2. Algebraic, exponential, logarithmic functions
     a. Solving equations
     b. Applications
     c. Exponential growth and decay
     d. Logistic growth
  3. Graphs of functions
     a. Using a table of values, basic functional graphs, and translation
     b. Using a graphing calculator, generate a table of values and draw a graph, selecting appropriate intervals for the x and y values and scale.
  4. Interpretation of functions numerically and graphically
B. Limits, continuity and derivatives
  1. Definitions
  2. Numerical and graphical interpretation of the limit
     a. Generate a table of values to determine the limit
     b. Given a graph, determine the limit
     c. Graph the function using a calculator and determine the limit
  3. Graphical interpretation of continuity
     a. Given a graph, determine continuity at a point
  4. Finding limits using limit rules
  5. Determining continuity of a function from the definition
  6. Finding derivatives using the definition of the derivative
  7. Rules of differentiation including the chain rule
  8. Derivatives of natural logs and exponential functions
  9. Higher derivatives
  10. Implicit differentiation
C. Applications of derivatives
  1. Equation of a tangent line; interpretation of the tangent line
  2. Rate of change
  3. Maximum-minimum problems
  4. Curve sketching
     a. Sketch curves by hand, using the first and second derivative tests
     b. analyze and interpret graphs by locating relative extrema, discussing intervals where the function is increasing or decreasing, discussing concavity and determining points of inflection
     c. Sketch curves using a graphing calculator and discuss relative extrema, intervals where the function is increasing or decreasing, concavity and points of inflection
     d. Given a graph of an applied function, use calculus-based analysis to interpret the behavior of the function
  5. Related rates
  6. Marginal analysis
D. Integration
  1. Techniques of Integration
     a. Antidifferentiation
     b. Method of substitution
  2. Area under a curve and the definite integral
  3. Fundamental Theorem of Calculus
  4. Applications
  5. Numerical integration with a graphing calculator
  6. Differential equations
     a. Initial value problems
     b. Interpretation of result
E. Multivariable functions
  1. Functions of several variables and their application
  2. Derivatives of multivariable functions
  3. Maximum-minimum problems and the method of LaGrange multipliers

VI. METHODS OF INSTRUCTION:

A. Classroom discussion
B. Collaborative learning where applicable
C. **Lecture** -
D. **Lab** - assignments
E. Computer and graphing calculator demonstrations

VII. TYPICAL ASSIGNMENTS:

A. Homework should be assigned from each section covered. The number of problems assigned will vary, but should include practice with both concepts and skills. For example, a typical homework set might include practice with specific differentiation techniques (15-20 problems) and 5-10 problems focusing on interpretation and applications of the derivative (e.g., rate of change, equation of tangent line). B. Group work can be done in-class or outside of class. A typical group activity would be: A model for advertising response is given by N(a) = 2000 + 500 ln(a) ; a > 1 where N(a) is the number of units sold and a is the amount spent on advertising, in thousands of dollars. 1. How many units were sold after spending $1000 (a = 1) on advertising? 2. Find N'(a) and N'(10). Interpret N'(10). 3. Find the maximum and minimum values, if they exist. Using your graphing calculator, graph this function over the interval [1, 15]. 4. Find the limit as a approaches infinity of N'(a). Discuss whether it makes sense to spend more and more dollars on advertising. C. Lab assignments can be used to review algebra concepts and skills, to explore the use of technology or to solve applied problems to a deeper level than is provided by just doing homework. A typical lab assignment would be: The total cost C and the total revenue R (in dollars) for the production and sale of x ski jackets are given by C(x) = 24x + 21,900 and R(x) = 200x – 0.2 x2, 0 ? x ? 1000 1. Find the profit function. 2. Find and interpret the cost, revenue and profit from the manufacture and sale of a. 50 ski jackets b. 200 ski jackets c. 400 ski jackets d. 800 ski jackets 3. Find the marginal cost, marginal revenue, and marginal profit functions. 4. Find and interpret the marginal cost, marginal revenue and marginal profit at a production/sales level of a. 50 ski jackets b. 200 ski jackets c. 400 ski jackets d. 800 ski jackets 5. Find the value of x where the graph of the revenue function has a horizontal tangent (HINT: solve R’(x) = 0). What is the revenue at that point? As you will see later in the course, the revenue function has its maximum value when the tangent is horizontal, so your revenue value is the maximum revenue earned. What is the marginal profit at that point? Interpret the result. 6. Find the value of x where the graph of the profit function has a horizontal tangent (HINT: solve P’(x) = 0). What is the profit at that point? This is the maximum profit earned. 7. In the same viewing window, sketch the graphs of the cost, revenue and profit functions for 0 ? x ? 1000. Copy these graphs onto your paper. Find the two break-even points algebraically. What is the connection between the break-even points and the graph of the profit function? What is the fewest number of ski jackets that the company could manufacture and still make a profit? What is the largest number of ski jackets that the company could manufacture and still make a profit?

VIII. EVALUATION:

A. **Methods**

1. Exams/Tests
2. Quizzes
3. Group Projects
4. Home Work
5. Lab Activities
6. Other:
    a. Methods of evaluation
        1. Examinations
        2. Announced or unannounced quizzes
        3. Other assignments
            a. Graphing calculator assignments
            b. Lab assignments
            c. Group work (in or out of class)
            d. Homework
            e. Final Exam

B. **Frequency**

1. Frequency of evaluation
    a. Recommended minimum of 4 exams plus a final examination
    b. Homework from each section covered in class
    c. Quizzes and other assignments at the discretion of the instructor. A minimum of 8 graphing calculator/lab assignments is recommended.
2. Types of problems:
    a. Most exam questions should be open-ended.
        1. Use the definition of the derivative to find the derivative of f(x) = x2 .
        2. If s(t) = 4t3 + 2t2 ? 3, then when t = 5 seconds, find the distance s, the velocity of the particle, and what is its acceleration?
        3. Find the relative extrema of the function f(x) = x4 – 2x2, if they exist. List your answers in terms of ordered pairs. Indicate specifically whether a point is a relative maximum or relative minimum.
        4. Find the indefinite integral for ? (2x – 4) dx.
    b. See Section VII for examples of typical assignments.

IX. TYPICAL TEXTS:

1. Bittinger, Marvin L., David J. Ellenbogen *Calculus and Its Applications.* 9th ed., Pearson/Addison Wesley, 2007.
2. Tan, Soo T *Applied Calculus for the Managerial, Life, and Social Sciences.* 10th ed., Thomson – Brooks/Cole, 2011.
3. Goldstein, Schneider, Lay & Asmar *Calculus and Its Applications.* 12th ed., Pearson/Addison Wesley, 2010.

X. OTHER MATERIALS REQUIRED OF STUDENTS:

A. A graphing calculator is required.