

Calculus for Social Sciences or Business Syllabus Updated Fall 2008

Course Information

Organization	Mathematics Dept - Liberal Arts Division
Course Number	MAT149
Credits	4
Contact Hours	4
Coordinator	John C. Nadig
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Description

MAT149 is designed for students of business and the social sciences. Application based topics include the fundamental techniques of differentiation and integration of algebraic, exponential and logarithmic functions, elementary differential equations, maxima-minima, functions of several variables, La Grange Multipliers, and Double Integration.

Prerequisites

MAT146 with a minimum C grade or qualifying college level placement test score.

Textbooks

Hoffman and Bradley. *Calculus for Business, Economics, and the Social and Life Sciences*. McGraw-Hill. 2007. **Edition:** 9th. **ISBN:** 978-0-07-305191-8.

Learner Supplies

Graphing calculator.

Core Abilities

- A. Use critical thinking and problem solving skills in analyzing information.
- B. Recognize when information is needed and have the knowledge and skills to locate, evaluate, and effectively use information for college level work.
- C. Use computers to access, analyze or present information, solve problems, and communicate with others.

General Education Outcomes

- A. Goal 2. Mathematics. Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.
- B. Goal 4. Technology. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

Course Goals

1. Solve, evaluate, interpret and graph polynomial and rational functions. [6 lecture hours]

Linked Core Abilities

Use critical thinking and problem solving skills in analyzing information.

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Use computers to access, analyze or present information, solve problems, and communicate with others.

General Education Outcomes

Goal 2. Mathematics. Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.

Goal 4. Technology. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

Learning Objectives

- a. Define function, domain of function, and range of function.
- b. Calculate values of a function and find the domain of a function.
- c. Define composite functions and find the composition of two functions
- d. Define and calculate inverse of a function.
- e. Construct and solve the function for a word problem from business or social science.
- f. Define and graph a function by plotting points.
- g. Translate from the (x,y) coordinate system to a (x',y') coordinate system.
- h. Define symmetry with respect to x-axis, y-axis, and origin and graph a function by using symmetry.
- i. Define linear function.
- j. Define slope, x intercept, and y intercept.
- k. Calculate slope given two points or the linear function.
- l. Find the equation of a straight line given two points, or point-slope, or any variation of the previous two conditions and graph the straight line.
- m. Construct the linear function from a word problem in business or social science.
- n. Explain continuous functions and locate points of discontinuity.
- o. Explain the limit concept and calculate limits.
- p. Calculate limits as x approaches infinity.
- q. Define a polynomial function and graph polynomials.
- r. Calculate x-intercepts of a polynomial.
- s. Define and graph a rational function.
- t. Find the intercepts of two functions and apply to word problem from business and social science.

2. Differentiate polynomial functions and use differentiation to solve word problems/applications.
[7 lecture hours]

Linked Core Abilities

Use critical thinking and problem solving skills in analyzing information.

Recognize when information is needed and have the knowledge and skills to locate, evaluate, and effectively use information for college level work.

Use computers to access, analyze or present information, solve problems, and communicate with others.

General Education Outcomes

Goal 2. Mathematics. Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.

Goal 4. Technology. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

Learning Objectives

- a. Apply the definition of the derivative.
- b. Apply the power rule, constant multiple rule, sum rule, product rule, and quotient rule in calculating the derivative.
- c. Calculate the derivative by using the chain rule.
- d. Calculate a derivative of an implicit function.
- e. Define an open interval, closed interval, half open interval to the left, and half open interval to the right.
- f. Define relative minimum, relative maximum, function increasing on an interval, function decreasing on an interval.
- g. Indicate the geometric significance of the sine of the derivative.
- h. Determine where a function is increasing or decreasing.
- i. Apply the first derivative to find the relative maximum or relative minimum and graph the function.
- j. Define the absolute extrema of a function on an interval and will be able to find this extrema given a function.
- k. Find an optimal (either a maximum or minimum) of a word problem.
- l. Define second derivative, concave up, concave down
- m. Apply physical interpretation of the second derivative of a function
- n. Define the second derivative test in order to find a relative minimum or relative maximum and apply this test given a function.
- o. Define average rate of change of y with respect to x , instantaneous rate of change of y with respect to x and apply these definitions given a function.
- p. Define and find the percentage rate of change given a function.

3. Differentiate exponential and logarithmic functions and use differentiation to solve word problems/applications. [4 lecture hours]

Linked Core Abilities

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Use computers to access, analyze or present information, solve problems, and communicate with others.

General Education Outcomes

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Goal 4. Technology. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

Learning Objectives

- a. Define the constant e .
- b. Apply the compound interest formula.
- c. Apply the present value of future money compounded continuously.
- d. Find the derivative of exponential and logarithmic functions.

4. Integrate polynomial, exponential and logarithmic functions and use integrations to solve word problems/applications. [7 lecture hours]

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Use computers to access, analyze or present information, solve problems, and communicate with others.

General Education Outcomes

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Goal 4. Technology. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

Learning Objectives

- a. Define an antiderivative.
- b. Determine if a function F is an antiderivative of a function f .
- c. Solve a differential equation by separation of variables.
- d. Calculate an integral by using the following formulas.
- e. Integrate by substituting a variable u for a function of x .
- f. Integrate by using the method of integration by parts.
- g. Integrate by using tables for a function
- h. Define a definite integral.
- i. Evaluate a definite integral.
- j. Calculate the area between a function and the x axis for a pre-defined set of limits.
- k. Calculate the area between two curves.
- l. Solve a differential equation by separation of variables.
- m. Solve exponential growth and decay model or a learning model using differential equations.
- n. Apply the summation notation for any given exercise.
- o. Define the average value of a function over an interval.
- p. Apply the formula of the average value of a continuous function $f(t)$ over an interval t $[a,b]$.
- q. Define the present value of a business venture.
- r. Calculate present value.

5. Compute partial derivatives and find extremum using second derivative test and Lagrange multipliers [6 lecture hours]

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General Education Outcomes

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Goal 4. Technology. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

Learning Objectives

- a. Find the domain for a function of several variables.
- b. Compute the value of a function of several variables given the values of each of the independent variables.
- c. Find a composite function and find its domain.
- d. Find $(r,s) = g(h(r,s))$ and specify its domain.
- e. Define and compute the partial derivative of a function of several variables with respect to a given variable.
- f. Calculate the derivative with respect to a variable t using the chain rule where every independent variable is a function of t .
- g. Define the level curve of a function.
- h. Find the equation of the level curve given a function of two variables and a specific point.
- i. Find the formula of a slope level curve.
- j. Define for a function of two variables relative minimum, relative maximum and critical points.
- k. Find an extrema by using the second derivative test.
- l. Find an extrema by using the Method of Lagrange Multipliers.
- m. Find a global extrema (maximum or minimum) or a constrained extrema by applying partial derivatives.
- n. Evaluate a double integral over rectangular region.
- o. Solve probability problems by using single and double integrations.

Grading Information

Evaluation of student learning:

Instructor created tests, quizzes, homework assignments and projects may be used in evaluating the students' progress. The instructor will create and administer a cumulative final exam. A suggested day-by-day schedule and suggested homework problems are available to the instructors from the course coordinator.

A possible plan for determining the students' final grades is as follows:

Unit tests (four - one for each of the first four units) 60%

Cumulative Final Exam 25%

Homework, Projects and quizzes 15%

Guidelines for Success

Academic Integrity Statement

Under no circumstance should students knowingly represent the work of another as one's own. Students may not use any unauthorized assistance to complete assignments or exams, including but not limited to cheat-sheets, cell phones, text messaging and copying from another student. Violations should be reported to the Academic Integrity Committee and will be penalized. Please refer to the Student Handbook for more details.