**SYLLABUS**

<table>
<thead>
<tr>
<th>Code:</th>
<th>MATH 176</th>
<th>Title:</th>
<th>CALCULUS WITH BUSINESS APPLICATIONS</th>
</tr>
</thead>
</table>

**Institute:** STEM  
**Department:** MATHEMATICS

**Course Description:** This course covers differential and integral calculus with applications in business, economics, and the life sciences. Topics include functions and their graphs, constructing mathematical models, the derivative and its applications, the integral and its applications, and exponential and logarithmic functions. Problems are approached from a variety of perspectives, including graphical, numerical, verbal, and algebraic through the use of computer software in class. This course is recommended for Business majors.

**Prerequisites:** A grade of C or higher in MATH 156.

**Credits:** 4  
**Lecture Hours:** 4  
**Lab:** 0

**REQUIRED TEXTBOOK/MATERIALS:**


  **Note:** MyMathLab (MML) will be required for online homework in some sections. Check with your instructor. A MML access code includes the ebook.

**RECOMMENDED MATERIALS:**

1. **Graphing Calculator** – If you are purchasing a new calculator, the TI-83 (any version) or TI-84 (any version) will be sufficient.

2. **Computer software** – *Converge* is used in this course. Your instructor will provide options for accessing *Converge*.

   **Note:** In compliance with copyright law, the Mathematics Department cannot give students copies of software. Unauthorized copying and/or distributing of software owned by Brookdale Community College is illegal.

3. **Free graphing software** – *Winplot* – is available for download at [http://math.exeter.edu/rparris/winplot.html](http://math.exeter.edu/rparris/winplot.html). It is highly recommended.

**ADDITIONAL TIME REQUIREMENTS:**

You will need to allow some on-campus time during each unit to meet with your group to work on each project. Some discussions can be done via email, but you will need some group meeting time and your group may need to meet with your instructor to discuss parts of the project.
OTHER TIME COMMITMENTS:

- In addition to the regular class hours, you will need to set aside time each week for homework. The weekly time will vary by topic and level of difficulty, but as an estimate, you should expect two homework hours for each class hour per week. For example, if your class meets for four hours per week, you should expect to spend about eight hours per week on homework.
- You may need to allow time on campus to do homework problems that require the use of computer software.
- If you are having any difficulty with the course material, you may need to allow time to see your instructor during office hours or to get help in the Math Lab.

COURSE LEARNING OUTCOMES:
Upon completion of this course, students will be able to:

- Demonstrate the mathematical skills appropriate to this course. (M)
- Apply the concepts, techniques and tools of calculus to the solutions of application problems in the fields of business and economics. (M)
- Use language consistent with current business and economic practices to interpret and report solutions in the context of the problem. (M)
- Use computer software to understand concepts and to explore and solve problems. (M)

Learning Outcome(s) support the following General Education Knowledge Areas:

- (M) Mathematics

GRADING STANDARD: In this course, you will be evaluated by means of tests, quizzes (and possibly homework), and projects.

A. TESTS
There will be three tests, one after each unit. All supporting work must be shown on tests in order for your instructor to properly assess your understanding of the material. Computer software and/or graphing calculators are used on these tests, although there will be non-computer parts. The tests will be given in class and it is expected that you will be in class to take the test on the day it is given. If you are very ill (verifiable with a doctor's note) or you have some other emergency, you must contact your instructor immediately.

B. QUIZZES/HOMEWORK
There will be periodic quizzes and your instructor may also choose to use certain homework assignments for evaluation.

C. PROJECTS
There are three group projects for the course, done outside of class. In each project, you will apply the concepts and skills learned in class to a problem situation, present the mathematics, write careful explanations, and interpret your results.
SYLLABUS

GRADING
Your final course average is determined by a weighted average as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test 1 (Unit 1)</td>
<td>25%</td>
</tr>
<tr>
<td>Test 2 (Unit 2)</td>
<td>25%</td>
</tr>
<tr>
<td>Test 3 (Unit 3)</td>
<td>25%</td>
</tr>
<tr>
<td>Quizzes/Homework/Projects</td>
<td>25%</td>
</tr>
</tbody>
</table>

FINAL GRADE
Your final grade is determined as follows:

<table>
<thead>
<tr>
<th>If your final course average is</th>
<th>Your final grade is</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 – 100</td>
<td>A</td>
</tr>
<tr>
<td>88 – 89</td>
<td>A-</td>
</tr>
<tr>
<td>86 – 87</td>
<td>B+</td>
</tr>
<tr>
<td>80 – 85</td>
<td>B</td>
</tr>
<tr>
<td>78 – 79</td>
<td>B-</td>
</tr>
<tr>
<td>76 – 77</td>
<td>C+</td>
</tr>
<tr>
<td>70 – 75</td>
<td>C</td>
</tr>
<tr>
<td>60 – 69</td>
<td>D**</td>
</tr>
<tr>
<td>Below 60</td>
<td>F</td>
</tr>
</tbody>
</table>

** To use this course as a prerequisite for another mathematics course, you must have a grade of C or better.

Incomplete
INC is only given at the discretion of your instructor. This may occur in documented cases of hardship or emergency. In this case, you must meet with the instructor to discuss the work that must be completed to earn a grade in the course. All work must be completed within 21 days after the end of the term, exclusive of official college closings.

Withdrawal
You may withdraw from the course, without penalty, up to a date set by the College. If you do not withdraw from the course but stop attending, your grade at the end of the semester will be F.

COURSE CONTENT:  (TEXT SECTION)

Unit 1: In this unit, you will review linear, quadratic, cubic, square-root, piecewise defined, and rational functions and use them to create mathematical models for applied situations. You will be introduced to the concept of the limit of a function and will use limits to determine whether a function is continuous. You will study average rate of change and use limits to determine instantaneous rates of change. You will estimate instantaneous rates of change and use an algebraic process to find the derivative of a function. You will develop formulas for derivatives of functions and become proficient in finding derivatives.
SYLLABUS

- Review linear and absolute value functions (topic 1)
- Use Converge or a graphing calculator to investigate properties of functions (topic 1)
- Define the break-even point and the equilibrium point (topic 1)
- Review quadratic, cubic, and square-root functions and use Converge or a graphing calculator to model business applications (topic 2)
- Review rational and piecewise defined functions and use Converge or a graphing calculator to model business applications (topic 3)
- Use Converge or a graphing calculator to construct polynomial models for applied situations (topic 4)
- Understand the concept of a limit and use Converge to estimate limits graphically and numerically (topic 5)
- Find limits of functions algebraically (topic 5)
- Use Converge to determine the limit of a rational function (topic 5)
- Use Converge to determine the end behavior of a function (topic 5)
- Discuss continuous functions and continuity and discontinuity at a point (topic 6)
- Determine whether a piecewise defined function is continuous (topic 6)
- Use Converge to determine continuity and discontinuity at a point (topic 6)
- Find the average rate of change and instantaneous rate of change using a table, a graph, and an equation (topic 7)
- Describe the differences between average rate of change and instantaneous rate of change (topic 7)
- Use Converge to sketch and find slopes of secant lines (topic 7)
- Define the slope of a curve at a point (topic 7)
- Define the derivative as the instantaneous rate of change (topic 8)
- Use Converge to estimate the instantaneous rate of change as a limiting value of average rates of change (topic 8)
- Use algebraic methods to find derivatives (topic 8)
- Define the situations when a derivative does not exist at a point (topic 8)
- Interpret derivative statements in the context of an application (topic 8)
- Learn and use derivative formulas for a linear function, a constant function, a power function (topic 9)
- Learn and use the formulas for the derivative of a constant multiple of a function, the sum of two functions, and the difference of two functions (topic 9)
- Apply derivatives to marginal analysis (topic 9)
- Learn and apply the derivatives of products and the derivatives of quotients (topic 10)
- Learn and apply the Chain Rule to differentiate a composition of two functions (topic 10)

Unit 2: In this unit, you will review exponential, logarithmic, and logistic functions and use them to create mathematical models for applied situations. You will find the limits of exponential and logarithmic functions. You will study the derivatives of these two functions. You will use the derivative to find absolute and relative extrema of a function. The applications of the first derivative test will be discussed. You will learn how to determine concavity, and to find inflection points. Business applications such as elasticity of demand, relationship of elasticity of demand and revenue, and maximizing revenue and profit will be studied.
SYLLABUS

- Review exponential and logarithmic functions and use Converge or a graphing calculator to evaluate a function (topic 12)
- Review solving equations involving exponential and logarithmic functions and use Converge or a graphing calculator to verify the solutions.
- Use Converge or a graphing calculator to construct exponential and logarithmic models for applied situations (topic 12)
- Discuss the logistic model and surge function (optional) (topic 12)
- Use Converge to determine the limit of an exponential or a logarithmic function (topic 12)
- Take derivatives of exponential and logarithmic functions (topic 13)
- Apply derivatives and the chain rule in the context of applications (topic 13)
- Find relative extreme points using the first derivative test and use Converge to verify these points (topic 14)
- Use the first derivative test in applications and interpret the meaning in the context of applications (topic 14)
- Use the second derivative to determine concavity and inflection points and use Converge to verify these points (topic 15)
- Use the first and second derivative tests to sketch graphs of functions (topic 15)
- Interpret the point of diminishing returns in economic applications (topic 15)(optional)
- Apply absolute extreme points of a function on an interval (topic 16)
- Find absolute extreme points and use Converge to verify these points (topic 16)
- Apply absolute extreme points in the context of applications such as elasticity of demand, relationship of elasticity of demand and revenue, and maximum revenue (topic 16) (optional)
- Learn several types of business applications involving revenue, maximizing profit, and maximizing yield (topic 18)
- Use Converge or graphing calculator to solve polynomial equations (topic 18)
- Learn business applications such as inventory control and the Cobb-Douglas productivity model (topic 18) (optional)

Unit 3: In this unit, you will study the problem of finding the area of a region bounded by a curve, leading to the definition of the definite integral. You will also find antiderivatives of functions, evaluate and interpret definite integrals, and find the area of a region between two curves. You will study improper integrals and investigate applications of integration to business situations such as future value, producer and consumer surplus, market surplus, and equilibrium point.

Unit 3 Outcomes: You will:

- Use Converge to approximate the area under a curve using rectangles (topic 24)
- Find the accumulated change in a quantity by using Converge to find the area between a graph and the horizontal axis (topic 24)
- Define antiderivatives (topic 20)
- Learn and use the formulas for antiderivatives for the power rule, a constant multiplier, the sum, and the difference of a function (topic 20)
- Find a specific antiderivative in an applied situation (topic 20)
- Learn and use the formulas for antiderivatives of exponential and log functions (topic 21)
- Explain the Fundamental Theorem of Calculus (topic 23)
- Define and evaluate the definite integral (topic 23)
- Interpret a definite integral in the context of an application (topic 23)
SYLLABUS

- Calculate and interpret the area between two curves (topic 24)
- Find Lorenz curve, and the Gini Index (topic 25) (optional).
- Calculate and interpret the following economic quantities: producer and consumer surplus, market surplus and equilibrium point (topic 25)
- Calculate and interpret future values for a continuous income flow (topic 26)

DEPARTMENT POLICIES:

The Math Department wants you to be successful in this course. Because of this, we have compiled a list of strategies and behaviors.

Attendance and class participation
- If you want to be successful in this course, attend every class.
- Come to class on time, and stay for the entire class period. If you are late or leave during class, you will miss important class material and you will also distract your classmates and your instructor. (See the Student Conduct Code)
- Turn off your cell phone during class. You and your classmates need to be free from distractions. (See the Student Conduct Code)
- Bring your book and calculator to every class.
- Respect your classmates and your instructor. Listen carefully to questions asked and answers given. Treat all questions with respect.
- Participate fully in class. Volunteer answers, work problems, take careful notes, and engage in discussions about the material. Use computers only for designated work. Above all, stay on task.
- Contribute your share to your in-class group work and your projects and do your best to make the group experience a positive one for all members.
- Do your own work on tests and quizzes. Cheating will not be tolerated. (See the Academic Integrity Code.)

Homework
- Homework is the way you practice the ideas and skills that are introduced in class. To be successful on the tests, you must do the homework. Homework may be collected and homework questions may be included on quizzes or tests.
- When you do the homework, write down all supporting work. Using the correct process is at least as important as getting the correct answer, so your work and steps are very important.
- Remember to check your answers. They will be in the back of the text or in the student’s solutions manual.
- If there are questions you can’t get or don’t understand, ask about them at the beginning of the next class. If you have trouble with more than a few problems, try starting your homework in the Math Lab, where help is available.

Absence
- If you are sick and an absence is unavoidable, please call or email your instructor. You are still responsible for all material that was covered during your absence. You are expected to read the textbook and do the homework.
- Make time to see your instructor when you return so that you can get any papers you missed.
- Remember that you are expected to be in class for the tests and quizzes.
SYLLABUS

Getting Help
After you have tried the homework, there are ways to get help:

- Look in your text and your class notes for examples similar to the problems you are finding difficult.
- See your instructor during office hours or make an appointment. Bring the work you have done.
- Go to the Math Lab to get extra help on your homework or simply go and do your homework there. Someone will be there if you get stuck. You don’t need an appointment to use the Math Lab.
- Form a study group with other class members. Working with other students can be a great way to learn. If you have a group to work with, consider meeting and working together in the Math Lab.
- Your textbook may have a complete solutions manual available in the Math Lab, which can be used in the Math Lab.
- You can use the computers in the computer lab within the Math Lab to do work related to your math course.
- In the Math Lab, you can get help on how to use your calculator.

Visit the Math Lab website to view hours and other useful information about the Math Lab.

COLLEGE POLICIES:
For information regarding:
- Brookdale’s Academic Integrity Code
- Student Conduct Code
- Student Grade Appeal Process

Please refer to the BCC STUDENT HANDBOOK AND BCC CATALOG.

NOTIFICATION FOR STUDENTS WITH DISABILITIES:
Brookdale Community College offers reasonable accommodations and/or services to persons with disabilities. Students with disabilities who wish to self-identify must contact the Disabilities Services Office at 732-224-2730 (voice) or 732-842-4211 (TTY) to provide appropriate documentation of the disability, and request specific accommodations or services. If a student qualifies, reasonable accommodations and/or services, which are appropriate for the college level and are recommended in the documentation, can be approved.