Students who register for this course need to have completed a prerequisite course in either College Algebra or Mathematics for Business and Economics with a grade of C or better. (If students also plan to go on to Business Calculus II, the preferred prerequisite is College Algebra.) Students who have taken the preceding course more than two years ago are not likely to do well in MATH 1425. Such students should be strongly urged by you to consider retaking the preceding course or registering for a lab course to accompany MATH 1425 or signing up for some help outside of class.

**Text:**  *Applied Calculus with Linear Programming* ... by Barnett & Ziegler, Pearson Custom Publishing. ISBN 0-536-97277-X.

This is a **custom edition** that was first used in 05-06. This book will be used in Bus Calc II.

**Optional for student:** Student *Solutions Manual*: ISBN 0-536-974055 The Student Solutions Manual material for some sections was not available, but the vast majority of the text is covered.

**Optional for instructor:** Our text is a custom text and the publishers don't print custom editions of the supplemental materials.

**Transfer:** Students who transfer to University of Texas must take both Business Calculus I and Business Calculus II at ACC to meet UT’s math requirements for business majors. ACC also has students who transfer to Texas State, Texas A&M and other schools that require Business Calculus I and Finite Math.

**General Comments:** Throughout you will find that the new text incorporates much more graphical interpretation than the old text.

The syllabus for this course contains some multivariable calculus material (sections 6.1-6.3) and does not cover the section on L'Hopital's Rule (3.7). The intention is to cover the multivariable material simultaneously with the single variable material. Throughout the course, the applications problems should be emphasized. Most are quite straightforward, so students don't struggle too much. On the whole, business calculus students are not interested in becoming adept in mathematics, but find the applications help their understanding.

You will want to watch what algebra mistakes the students make, decide which algebraic techniques are most crucial, and focus on those techniques where necessary.

Unfortunately, Business Calculus students often are inclined to believe that they have learned to work a problem when they can follow someone else's solution. Part of your job as instructor is to puncture that false confidence without demoralizing them. We frequently discuss the pitfalls of using the solution manual too freely, and encourage the students to make up sample tests for themselves from the review section, take these under test conditions, and then grade them. Do
note that in this book, an even numbered problem is often just like the previous odd numbered problem.

**Calculators:** Students are encouraged to use scientific calculators to do computations. Some students will have programmable or graphing calculators or access to graphing technology via computer. Learning to use these well can significantly enhance their understanding of calculus and their interest in it. Some teachers believe that forbidding the use of programmable and graphing calculators on tests sends a negative image to students about their value. One compromise is to restrict graphing calculators on the test that specifically covers graphing, but to allow them otherwise.

When students are required to show their work on all problems to receive credit, they are more likely to understand that they must really learn to do the problems and not just rely on the magic of a calculator. It is true that students who have graphing calculators and are adept at using them have some additional tools for checking their answers. Acknowledgment of this can be used to lead into a discussion of ways to check one's work without a calculator as well as with a calculator -- a discussion well worth having in a calculus class.

**Outside Help:** Walk-in tutoring is available in the Learning Labs. Some lab classes are available, as listed in the schedule. Encourage students who need regular tutoring to use these if they are available.

**Homework:** Students need to do homework regularly. Instructors who check homework assignments regularly notice a higher retention rate. This is time-consuming, but it is worth considering.

**Tests:** Remember that the business calculus courses should place emphasis on application problems. **At least 30% of the overall testing should be word or application problems. In this course, we consider a comprehensive final exam to be essential.** Some of the students will be planning to transfer to the University of Texas, and will take the second half of the sequence, our Bus Calc II or UT's M403L. After preparing for a comprehensive final in your course, they will be more likely to succeed in a Business Calculus II course.

**Chapter-by-chapter Comments based on the expected text.**

**Introduction**
The intention is for instructors to include the multivariable material simultaneously with the single variable material. Most instructors do an introduction to functions at the beginning of the course. That introduction should include section 6.1, multivariable functions. Be sure to point out to students the need to pay attention to the function name and the variable(s). y may be the function, y = f(x), or y may be one of the variables, z = f(x,y)

**Chapter 1 and Sections 6.1-6.3**

1.1-1.2, 6.1,
Limits and continuity are presented in an intuitive fashion. Graphs and numerical approximations are used to develop these concepts. There is less algebra on limits than in the previous text.

1.3, 6.2
Include the concept of the partial derivative while presenting the derivative. These concepts are fairly intimidating. Don't spend too long here. There will be lots of practice later on derivatives


and applications.

1.4-1.6, 6.2
Include the computations for the partial derivatives with the computations in sections 1.4-1.6. By the time you get to sec. 1.4 where the derivative shortcut formulas are presented, your students will begin to relax and enjoy their introduction to calculus. A few will have forgotten how to use fractional and negative exponents, and that should be emphasized. It's a good idea to explain, as soon as the derivative rules are introduced, that later they will need to set them equal to zero and solve. This helps them to understand why one would factor derivatives as the answers indicate. If they focus on factoring correctly here, Chapters 2 and 3 go more smoothly. Sec. 1.6, on the general power rule (chain rule), really gives them an algebra workout.

1.7
Marginal analysis is a major application of calculus in economics. One student wondered why marginal cost is defined as a rate of change here, but in her economics text it is defined as the cost of producing an additional unit. A small survey of economics books found that it was defined as the cost of producing an additional unit in all three undergraduate books, and as the derivative in both graduate books. None of the books discussed how to determine which definition is most appropriate in a particular situation. It is left to math teachers to help students think about what considerations should be involved in choosing the discrete or continuous formulation of marginal cost.

Chapter 2 and section 6.3

This chapter covers the relationship between derivatives and curve sketching. You are likely to find your better students accurately graphing the C-level functions. On occasion, we have used C-level problems as test questions. Include the exercises on the second order partials in section 6.2 when covering section 2.2 The chapter also has maximum-minimum and optimization word problems in 2.4 and 2.5, which should be followed by the multivariable max-min problems in section 6.3. Section 2.6 is on differentials. In the optimization sections (2.4, 2.5 and 6.3), you should probably split the assignment of word problems over two or three different days so that your students won't feel overwhelmed. Be sure to emphasize the difference between derivative word problems and differential word problems.

2.6
This is the section on differentials. The solutions manual and answers for odd problems will not be in the books.

Appendix

The appendix allows students to review exponential and logarithmic functions before learning to differentiate them in Chapter 3. This review of exponential and logarithmic functions is crucial for those most students. To emphasize that one must follow rules in algebra, it is a good idea to point out that there are new rules about equations--ones that are not used in early algebra courses.

Chapter 3

3.1
We recommend that you review simple and compound interest before starting this material on continuous compound interest, and assign problems of all three types, rather than just those given on continuous compound interest.
3.2, 3.3
Finding critical values for these functions requires a renewed focus on solving equations. That's difficult again for students in this new context. Students need more explanation of and practice on intercepts and asymptotes than is given. In particular, vertical asymptotes are not adequately discussed. It's a good idea to write out a procedure for students to follow in finding vertical asymptotes for exponential and logarithmic functions. One possible procedure is: Look at values where the denominator is zero as possible vertical asymptotes, and also look at values on the edge of the domain of a log function. To tell whether a "possible" asymptote is "in fact" an asymptote, plot a few values (find the limit by completing an appropriate table).

3.4 and some problems in section 6.2
The general chain rule in function notation is fairly intimidating. Students probably get just as good a feel for it if you discuss the three special cases of the chain rule (talking about taking the derivative of the "outer" function and then the "inner" function). Include the exponential and logarithmic problems from section 6.2. Elasticity of demand is an important application of the derivative in economics.

3.5
Some students will find implicit differentiation frustrating. We find that using the $d/dx$ notation helps them to see which variable is controlling the problem. Covering the multivariable along with the single variable makes this a bit easier. Because the problems require both taking derivatives and solving a literal equation, we find some more success by doing only one, fairly simple implicit differentiation problem first, and then practicing the derivative part. First, $y^2$, $y^3$, $y^4$, then $xy^2$, $x^2y^3$, etc., then $xe^y$, $x^2 \ln y$, etc. After they have gone through all of that, doing a complete implicit differentiation problem isn't nearly so hard.

3.6
Related rate problems are also quite frustrating for many students. We point out that finding the equation is not usually very hard here--it's only keeping track of what things are changing over time, and remembering the procedure.

Chapter 4
It may seem that integration is presented in a backward fashion, first as the antiderivative, later in terms of area, and only in at the end of the chapter does the Fundamental Theorem of Calculus appear. This method maximizes the amount of time students can spend using substitution, which is good.

4.1-4.2
The first section is quite easy, since we just "undo" all the easy derivative rules. The second section, where we "undo" the chain rule, is another matter. Even after students have thoroughly learned to do substitution, they will still need more practice in deciding when substitution is necessary. We think that it is crucial to emphasize showing all steps and using proper notation when doing substitution. While students can do some of the easy substitution problems mentally, if they don't learn how to write it out, they will be lost when they get to the harder problems. Even worse, they will be fuzzy about the fact that substitution doesn't always work--that the appropriate factor is not always there.

4.3
This section on growth laws might seem strangely placed. The solving of differential equations by separation of variables is pretty complicated for the third day of antiderivatives. In fact, the author of the book only expects students to recognize the appropriate growth model, use Table 1 to find the solution, and solve for the constants. This is a good time to introduce the idea of a differential equation (which reappears in Bus Calc II).

4.4
There are a variety of opinions on how much detail to go into with the definition of definite integral and the summation of finite number of rectangles. After making sure that students understand the definition of the definite integral in 4.4 most instructors choose to concentrate more on section 4.5, and applications in Sections 5.1 and 5.2.

Chapter 5 Sections 1 and 2
It is important that you complete all of both sections 1 and 2, since Business Calculus II begins with section 3. Section 1 discusses area between curves. Section 2 develops a number of applications--average value of a continuous function, present value of an income stream, and consumer and producer surplus. Students do not have much trouble with these topics, but be sure to allow enough time. Students must have adequate practice in integration before moving on to the second half of the course.
MATH 1425 Suggested Assignments
* The intention is for instructors to cover the appropriate multivariable material at the same time as the single variable.

1.1 1, 3, 5, 9, 11, 13, 15, 19, 21, 25, 29, 31, 39, 41, 43, 49, 53, 71, 75
6.1 * 1, 5, 13, 17, 27, 29, 39, 41, 43, 45
1.2 3, 5, 7, 9, 11, 13, 15, 17, 19, 23, 29, 33, 49, 53, 71, 73, 77
1.3 1, 3, 7, 15, 19, 23, 25, 27, 31, 33, 35, 37, 41, 47, 49, 59, 61, 63
1.4 3, 7, 11, 15, 19, 21, 23, 27, 31, 33, 35, 39, 43, 45, 49, 51, 55, 71, 75, 81, 83
1.5 3, 7, 11, 13, 15, 21, 25, 29, 31, 33, 35, 37, 39, 41, 47, 51, 53, 57, 65, 67
1.6 3, 11, 15, 19, 21, 27, 31, 35, 39, 43, 47, 49, 51, 55, 68, 71, 75, 77, 79
6.2 * 5, 9, 11, 13, 33, 35, 41, 51, 61, 63, 65, 67, 69, 71
1.7 1, 3, 9, 11, 13, 15, 17

2.1 1, 3, 5, 7, 13, 15, 17, 21, 25, 29, 31, 47, 51, 55, 57, 61, 65, 69, 73, 87, 89, 91
2.2 1, 7, 11, 13, 17, 19, 31, 35, 39, 43, 55, 61, 63, 65, 67
6.2 * 7, 15, 17, 45, 47,
2.3 1, 5, 9, 13, 27, 33, 39, 47, 63, 69, 71, 73
2.4 3, 9, 15, 21, 27, 31, 37, 41, 43, 47, 49, 53
2.5 5, 7, 11, 13, 17, 19, 21, 25, 29, 31
6.3 * 3, 7, 9, 11, 13, 19, 21, 29, 31, 35
2.6 3, 7, 11, 17, 19, 23, 27, 37, 39

3.1 3, 7, 9, 17, 19, 21, 23, 25
3.2 3, 7, 11, 17, 21, 25, 29, 31, 33, 39, 41, 45, 49, 57, 59, 63
3.3 3, 9, 13, 17, 21, 27, 29, 33, 37, 43, 45, 49, 51, 55, 61, 69, 71
6.2 * 19, 23, 25, 29, 37, 39, 49, 59
3.4 5, 11, 17, 21, 23, 25, 27, 47, 49, 51
3.5 3, 7, 13, 15, 17, 19, 21, 23, 29, 33, 39, 43, 45
3.6 5, 9, 13, 17, 21, 25, 27, 29

4.1 3, 5, 11, 19, 21, 27, 29, 35, 39, 45, 49, 53, 57, 61, 67, 71, 73, 77, 81, 85, 87, 99, 101, 103
4.2 3, 7, 9, 15, 19, 23, 25, 29, 31, 35, 37, 39, 51, 57, 61, 67, 69, 71, 73
4.3 7, 9, 11, 21, 47, 49, 51, 53
4.4 1, 17, 23, 31, 37
4.5 5, 9, 15, 19, 23, 27, 31, 35, 39, 43, 47, 49, 53, 61, 63, 67, 69, 73, 79

5.1 3, 9, 13, 19, 23, 33, 35, 39, 49, 53, 65, 67, 69
5.2 7, 11, 15, 19, 21, 25, 27, 31, 33, 37, 41
First Day Handout for Students

MATH 1425 Business Calculus & Applications I Session (Fall/Spr 2006/7)
Section # Time of class Room Number:

Instructor:
Office:
Office Phone:
E-mail:
Office Hours:
Other times by appointment:

COURSE DESCRIPTION
MATH 1425 BUSINESS CALCULUS AND APPLICATIONS I (4-4-0) is a course treating standard one-variable calculus and its applications for business students, as well as selected other business applications, and an introduction to multivariable calculus. Calculus topics include the derivative, methods of finding derivatives, applications of derivatives, the integral, methods of integration, applications of integration, and the calculus of the exponential and logarithmic functions. Multivariable calculus topics include partial derivatives and finding local extrema.
Prerequisites: One semester of high school elementary analysis or the equivalent with a grade of B or better or MATH 1324 or 1314 or the equivalent.

This book is also used for Business Calculus II.

Calculator: Students need either a scientific or business calculator. If you cannot purchase one, they are available from the library. Graphing calculators are encouraged, but their use may be restricted on the graphing test. Most ACC faculty are familiar with the TI family of graphing calculators. Hence, TI calculators are highly recommended for student use. Other calculator brands can also be used. Your instructor will determine the extent of calculator use in your class section.

COURSE EVALUATION/GRADING SCHEME

Include Your Missed Exam Policy statement

Homework Policy, including your policy about late work

Include your statement on Class Participation expectations

Incomplete Grade Policy: Incomplete grades (I) will be given only in very rare circumstances. Generally, to receive a grade of "I", a student must have taken all examinations, be passing, and after the last date to withdraw, have a personal tragedy occur which prevents course completion.

Attendance Policy: Include YOUR attendance policy, even if it is that attendance is not required. Math Department's: Attendance is required in this course. Students who miss more than 4 classes may be withdrawn although the instructor makes no commitment to do so.
Withdrawal Policy: It is the student's responsibility to initiate all withdrawals in this course. The instructor may withdraw students for excessive absences (4) but makes no commitment to do this for the student. After the last day to withdraw, (insert date), neither the student nor the instructor may initiate a withdrawal.

Reinstatement Policy (if applicable)

INSTRUCTIONAL METHODOLOGY: This course is taught in the classroom primarily as a lecture/discussion course.

COURSE RATIONALE: This course is a standard calculus course for business students. At ACC it is part of a two-course business calculus sequence. Business Calculus I covers one-variable calculus and some multivariable calculus. The course stresses applications in business and economics, and is intended to give business students the appropriate conceptual and computational mathematical background for future study in business.

COMMON COURSE OBJECTIVES: Common course objectives are attached. They also can be found at: [http://www2.austin.cc.tx.us/mthdept2/tfcourses/obj1425.htm](http://www2.austin.cc.tx.us/mthdept2/tfcourses/obj1425.htm). (You are required to include the common course objectives in your first day handout. Do not just provide the Web address.)

Course-Specific Support Services: Sometimes sections of MATH 0163(1-0-2) are offered. The lab is designed for students currently registered in Business Calculus and Applications I, MATH 1425. It offers individualized and group setting to provide additional practice and explanation. This course is not for college-level credit. Repeatable up to two credit hours. Students should check the course schedule for possible offerings of the lab class.

ACC main campuses have Learning Labs which offer free first-come, first-serve tutoring in mathematics courses. The locations, contact information and hours of availability of the Learning Labs are posted at: [http://www.austincc.edu/tutor](http://www.austincc.edu/tutor)

Include the following policies that are listed in the First Day Handout section of the Math Manual. Go to [www.austincc.edu/mthdept5/mman06/statements.html](http://www.austincc.edu/mthdept5/mman06/statements.html) Insert full statement for each of the following in your syllabus.

Statement on Scholastic Dishonesty

Statement on Scholastic Dishonesty Penalty

Statement on Student Discipline.

Statement on Students with Disabilities

Statement on Academic Freedom
**TESTING CENTER POLICY:** ACC Testing Center policies can be found at:  
[http://www.austintce.edu/testctr/](http://www.austintce.edu/testctr/)

**STUDENT SERVICES:** The web address for student services is:  
[http://www.austintce.edu/rss/index.htm](http://www.austintce.edu/rss/index.htm).  
The ACC student handbook can be found at: [http://www.austincc.edu/handbook/](http://www.austincc.edu/handbook/)

**INSTRUCTIONAL SERVICES:** The web address is:  
[http://www.austincc.edu/faculty/newsemester/](http://www.austincc.edu/faculty/newsemester/). Then click on “Campus Based Student Support Overview”.

### COURSE OUTLINE/CALENDAR for Business Calculus I, MATH 1425

<table>
<thead>
<tr>
<th>Week</th>
<th>16 Week Semester</th>
<th>11 Week Semester</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Intro 6.1, 1.1</td>
<td>6.1, 1.1, 1.2</td>
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<tr>
<td>2</td>
<td>1.2-1.3, 6.2 concept of partial der.</td>
<td>1.3, 6.2 concept, 1.4-1.5</td>
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<td>3</td>
<td>1.4-1.6, 6.2 computations of par.der.</td>
<td>1.6, 6.2 comps, 1.7, Test</td>
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<td>4</td>
<td>1.7, Test</td>
<td>2.1, 2.2 and 6.2, sec. par., 2.3</td>
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<tr>
<td>5</td>
<td>2.1, 2.2, 2.3 and 6.2 sec. order partials</td>
<td>2.4, 2.5, 6.3, 2.6</td>
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<td>6</td>
<td>2.4, 2.5</td>
<td>Test, Appendix, 3.1-3.3</td>
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<tr>
<td>7</td>
<td>6.3, 2.6</td>
<td>6.2 exp &amp; ln, 3.4-3.6</td>
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<td>8</td>
<td>Test, Appendix</td>
<td>Test, 4.1-4.2</td>
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<tr>
<td>9</td>
<td>3.1-3.3, and 6.2 exp and ln problems</td>
<td>4.2-4.4</td>
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<tr>
<td>10</td>
<td>3.4, 3.5</td>
<td>4.5, 5.1</td>
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<tr>
<td>11</td>
<td>3.6, Test</td>
<td>5.2, Review, Final Exam</td>
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<td>12</td>
<td>4.1, 4.2</td>
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<td>13</td>
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<td>14</td>
<td>4.5, 5.1</td>
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<tr>
<td>15</td>
<td>Test, 5.2</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Review &amp; Comprehensive Exam</td>
<td></td>
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*Please note: Schedule changes may occur during the semester. Any changes will be announced in class.*