Department of Mathematics, Bucknell University **Academic Year 2006–07**

STUDENTS' GUIDE TO CALCULUS OFFERINGS AT BUCKNELL

Overview. Bucknell offers two essentially different introductory calculus courses, both of which presuppose a high school course in pre-calculus. MATH 192 is a terminal course designed for students in the social sciences; MATH 201 (or MATH 205—see below) is the first course in the core calculus sequence for mathematics, science, and engineering students. Either course qualifies as a non-laboratory science satisfying the Disciplinary Breadth requirement of the College of Arts and Sciences' Common Learning Agenda. (Recommended ways to satisfy this requirement with a mathematics course other than calculus include MATH 111 and MATH 216, which do not require a high school background in pre-calculus.)

Calculus for the Social Sciences. MATH 192 (Topics in Calculus) is a one-semester *terminal* calculus course, offered second semester only. It satisfies the minimum calculus requirement for economics majors and for BSBA students, but is not a good choice for students hoping to enter graduate programs in economics. These students, and other mathematically strong students, are encouraged to replace MATH 192 with MATH 201, thereby enabling them to continue the calculus sequence should they so desire.

Calculus for Mathematics, Science, and Engineering. The core calculus sequence consists of MATH 201 (Calculus I), MATH 202 (Calculus II), and MATH 211 (Calculus III). This sequence or its equivalent is required of almost all mathematics, physical science, and engineering students at Bucknell. Most students in the life sciences are required to take only MATH 201 (and a statistics course), but may wish to complete the calculus sequence. Other students to whom we particularly recommend this calculus sequence include the more mathematically able BSBA and economics students.

Variations among our first-semester core calculus courses accommodate students with differing mathematical backgrounds:

- **Within MATH 201**. Lower numbered sections of MATH 201—roughly Sections 01–15, but check!—are for students who have taken calculus in high school, but have not placed out of Calculus I. The remaining sections, numbered from 20 on, are for the 20% or so of Calculus I students with very little or no prior exposure to calculus.
- **MATH 205–06**. This is an accelerated calculus course covering the material of MATH 201 and MATH 202 in one semester. Students normally earn two course credits, but have the option of dropping out after completing the Calculus I syllabus, in which case they receive one course credit (for MATH 205); they also may drop back to MATH 201 during the first few weeks of the semester. For purposes of prerequisites and degree requirements, MATH 205 is equivalent to MATH 201 and MATH 206 is equivalent to MATH 202.

Placement. Many students enter Bucknell with one or more calculus credits obtained either from the Advanced Placement Examination or by transfer from another college. Furthermore, all entering students are asked to tell us whether they have taken a high school calculus course. Students are placed as follows:

- Students scoring 1 or 2 on either the AB or BC Advanced Placement exam are placed in one of the lower-numbered sections of MATH 201, as are students who have taken a high school calculus course.

- Students who have not taken a high school calculus course are placed in one of the higher-numbered sections of MATH 201.
- Students scoring 3 on the AB exam are placed in MATH 205.
- Students scoring 4 or 5 on the AB exam or 3 on the BC exam, or having transfer credit for Calculus I, are placed in MATH 202 and receive credit for MATH 201.
- Students scoring 4 or 5 on the BC exam, or having transfer credit for Calculus II, are placed in MATH 211 and receive credit for MATH 201 and MATH 202.

No placement policy is perfect, and exceptions to the above guidelines are possible. Students who continue to be uncomfortable with their placement after attending a few classes should discuss their situation with the Chair of the Mathematics Department. Sometimes they may be placed in a more advanced course than is prescribed by the guidelines, although without receiving credit for the course skipped. Conversely, it is possible (although more complicated) for the University to withdraw either AP credit or transfer credit if students find themselves unprepared for the course they have been assigned. On the other hand, differences between the two types of sections of MATH 201 should be maintained, and switching sections within MATH 201 so as to violate the above guidelines is almost never advisable.

Gateway Exam Policy for MATH 201. The Mathematics Department requires every MATH 201 student to pass a basic skills gateway exam. A student must get at least five of six problems correct to pass; no partial credit will be awarded and no calculator or formula sheet will be allowed. Students will be given four opportunities during the semester (on days determined by the department) to pass a gateway exam. If a student fails all four gateway exams, the student will not pass the class. If the student misses an exam, for whatever reason, the student will not be given a make up exam. He or she will just forgo one trial and will move to the next one.

Questions will be chosen from the following list: computations with the quotient rule, chain rule, product rule, elementary derivatives, equations of lines, solutions of quadratic equations, and graphs of important functions (sine, cosine, tangent, natural logarithm, exponential functions, polynomials of up to degree 3, and simple variations of these functions). A sample gateway exam will be provided before the test is given and is available on the department's website.

Calculators. Sophisticated calculator skills are a required part of every calculus course. The TI-89, available from the book store, is the required calculator for the core sequence MATH 201, 202, 211. The TI-89 has essential symbolic capabilities as well as the usual numerical and graphical ones, and instruction on its use is included in each course. In the past, some students have attempted to get by with a different calculator, virtually always with negative if not disastrous results.

Resources. Drop-in calculus help sessions are held Sunday–Thursday evenings, usually 7:00–9:00 p.m. They are staffed by graduate students and upper-class undergraduate students.

Advice. Here is a recipe for succeeding in calculus that works for nearly all students who follow it conscientiously: attend every class; come to class prepared; ask questions; seek help *as soon as* you start having difficulty; and remember that this advice applies even if you think you are repeating material you learned in high school.

In order to "come to class prepared, " you must go over the material from the previous class, do the assigned reading, and complete the assigned homework *whether or not the instructor is going to collect it.* "Seek help" means attend the calculus help sessions and your instructor's office hours.