MATH 152 - SPRING 2005

MATHEMATICS FOR THE LIFE SCIENCES

Time: 10:10 - 11:00 Monday and Wednesday, labs Tuesdays at various times

Place: Buehler 300. Recitation sections will meet in the rooms assigned. Labs will be held in Ayres 15.

Instructor: Dr. Louis Gross, Professor of Ecology and Evolutionary Biology and Mathematics

Office: 639 SERF. Office Hours: Monday and Wednesday 11-1 and by appointment. Phone: 974-4295
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Teaching Assistants:
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Course web page: http://www.tiem.utk.edu/~gross/math152.html

This course, a continuation of Math 151, will provide an introduction to a variety of mathematical topics of use in analyzing problems arising in the biological sciences. It is designed for students in biology, agriculture, forestry, wildlife, pre-medicine and other pre-health professions. The Math 151-2 sequence, depending upon your curriculum, will partially satisfy graduation requirements for your major. The general aim of the sequence is to show how mathematical and analytical tools may be used to explore and explain a wide variety of biological phenomena that are not easily understood with verbal reasoning alone. Prerequisites are two years of high school algebra, a year of geometry, and half a year of trigonometry and successful completion of Math 151. Note that this semester provides a very rapid overview of calculus, covering a large portion of the material covered in Math 141-2, but in one semester and with biological rather than physical examples. Students completing Math 152 and doing well, could potentially go on to take 200-level math courses (particularly Math 231), but it would be preferable to take the complete Math 141-2 sequence if you intend to go on to 200-level math courses. Students are reminded that there are a variety of tutorials available at the www.mathclass.org site designed specifically to help you refresh your understanding of pre-calculus ideas.

This course includes a laboratory component which makes use of computer facilities in the Math Department. No prior background in the use of the main software package for the course (Maple) is expected, though from their exposure to another package in Math 151 (Matlab) students are expected to be able to rapidly utilize this other program. The textbook be followed much more closely than in Math 151, but there will be additional topics discussed, particularly in conjunction with computer assignments, and biological examples. Students should plan to attend all class sessions, although no formal roll will be taken. The text for the course is: *Mathematics for the Biosciences* by Michael Cullen. There is no supplement for this semester, but a variety of additional material will be posted on the course web site.

Course Goals:

Develop an appreciation for the application of the ideas of calculus to biological problems.

Develop your ability to quantitatively analyze problems arising in the biological areas of interest to you.

Illustrate the great utility of mathematical models to provide answers to key biological problems.

Develop your appreciation of the diversity of mathematical approaches potentially useful in the life sciences.

Provide experience using a computer algebra system to rapidly analyze problems that may be difficult to analyze without this.

Course Grading: The grade will be based on several components: (a) There will be a set of brief (5-10 minute) quizes, generally given once a week at the end of a class period (during the lab period in weeks for which there is no exam scheduled); (b) There will be a set of assignments, some of which will be based on the use of the computer to analyze particular

sets of data, or problems. These may be worked on within a study group, as long as it is clearly noted who participated, and each individual writes their own results; (c) There will be a set of three exams during the term, in addition to a comprehensive final. The exams will not be computer based. They will focus on the key concepts and techniques discussed in the course. Of the three regular exams given, the one with the lowest score will be dropped. The final exam will be given Friday May 6 from 10:15-12:15 in Buehler 300. The weighting of these components of the grade are: (a) 25%, (b) 15%, (c) 60% (the final exam counts 30% of the course grade, and the two regular exams not dropped will together count 30% of the grade).

There will also be opportunities for extra credit for those desiring this. One opportunity will require the participant to evaluate a software program involving some area of biology - this requires becoming very familiar with the program, and writing a formal review of the software, in the same format as might appear in a scientific journal. Participants are expected to regularly work problems from the text, or problems assigned by the instructor. These should be worked on individually, but will not be graded. Questions about these problems may be addressed during lab periods or by attending the office hours of your teaching assistant.

Course Outline: The pace of the material covered will be adjusted as necessary, but the approximate time to be spent on various topics over the semester and the dates of coverage are given below.

Limits of functions and continuity - Text sections 6 & 7 - Jan 12-25

Derivatives - Text sections 8-11 - Jan 26-Feb 14

Exam 1 - Feb 15

Curve sketching and optimization - Text sections 12-14 - Feb 16-22

Calculus of exponentials and logarithms - Text sections 16-17 - Feb 23-March 1

Antiderivatives and integrals - Text sections 18-19 - March 2-14

Exam 2 - March 15

Definite integrals and applications - Text sections 20-25 - March 16-29

Calculus of trigonometric functions - Text sections 29-31 - March 30-April 11

Exam 3 - April 12

Differential equations and modeling - Text sections 33-39 - April 13-26

Review - April 27

Final Exam - May 6, 10:15AM -12:15PM, in Buehler 300