# MATH 11A: Calculus with Applications

Instructor:

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Office hours will be posted on the web site shortly

## Teaching Philosophy:

The main goal is self-actualization through the empowerment of claiming your education:

1. As much as the material itself, the processes that you learn in this course will stand by you in the future
2. I am organized and have carefully selected material for you to learn; I value your time as much as my own.
3. You conduct focused hard work, since there is no success without work.
4. Hard work and serious scholarship can be fun.

Course Slogan: SIAM – Science and Industry Advance through Mathematics

## What I expect you to know coming into Math 11A

Operations on real and complex numbers, polynomials and rational expressions
Exponents and radicals
How to solve linear and quadratic equations
How to graph linear and quadratic functions

You should have a passing grade in Math 2B or 3, a score of 31 or higher on the placement examination, or transfer credit approved by Mike Mosley (mjmosley@cats).

I also expect that you plan to attend every lecture and every discussion section.

Grades will be determined as follows:

1) Midterm -- 30%
2) Final examination worth – 30%
3) Homework – 20%
4) Weekly quiz – 15%
5) Participation in section –5%

Letter grades will be determined as follows: Fail: <50%, D: 50-61%, C: 62-73%, B: 74-86%; A: >86%.

Evaluations will report your midterm, final, quiz and homework scores, along with the class average and standard deviation. Comments from TAs about your performance will be added as appropriate.

Examinations Examinations will be short answer, put the answer in the box with no partial credit given. The midterm is Friday 13 February 2004. The final examination is Monday 15 March, 8-11 am. It covers the entire course. Exceptions to this date must be discussed with me by Monday 8 March 2004; only early finals will be given as exceptions.

Homework is due at the start of the second discussion section of the week; you may want to bring a copy for yourself for taking notes during the discussion section. Homework must be stapled with the name of your TA clearly written on the first page. The exception is the first assignment, which is due at the first discussion

The late homework policy is simple. ABSOLUTELY NO LATE HOMEWORK WILL BE ACCEPTED UNDER ANY CIRCUMSTANCES. Homework assignments are described in the Course Supplement.

Discussion Sections are mandatory. In the first section of the week, the TA will go over problems that are due that week (giving you hints for solving them). In the section section of the week the TA will go over the problems, answer questions about lecture and give a quiz.

Textbook: *Calculus for Biology and Medicine*, 2nd edition (2004) by Claudia Neuhauser. This is an excellent book. Buy it.

Hints for Success in a course taught by Mangel (by Kerry Murphy, Fall 1993)

1. Create a small study group. Set up a time to meet. Treat it as a class and attend every meeting.

2. Discuss homework with your study group. You'll be surprised by the many different ways to approach a problem. These discussions will promote a better understanding of the material and improve problem solving approaches.

3. Attend office hours habitually and always attend discussion section. Having done the homework, you will usually have questions. Attend no matter how few questions you have. Other students will inquire about topics that you may not have considered. These new ideas and approaches can be expanded in your homework before you turn it in.

4. Don't overlook the importance of homework. It is a major portion of your grade and you will be rewarded for time spent.

5. Do one or two practice problems with your study group each week. They may give insight into your homework, but most of all you will be slowly preparing for the exams. Procrastination will catch up with you in the long run!

The Importance of Study Skills

The pace of UC courses is much faster than either high school or community college and may require that you further develop your study skills (check out what your College offers in this area).

- Keep up with the material.
- Start your homework as soon as possible, but no later than Tuesday.
- Start preparing for the exams about a week in advance
- Keep in touch with your TA and me if you are having problems. We want you to succeed.

Core topics for this course

Definition of a function, its limits, continuity and derivatives.
The product, quotient and chain rules and implicit differentiation.
The trigonometric, exponential and logarithmic functions.
Taylor expansion
The inverse of a function.
The Mean Value Theorem.
The monotonicity and concavity/convexity of a function.
Applications, especially in biology

Approximate Topical Outline and Related Sections of the Text (which you are to read after the lecture)

5 January

Introduction to the course: Why we study rates
Elementary functions (Sections 1.1, 1.2)
Biological theme: Darwinian paradigm and the Central Dogma

7 January

Functions continued
Graphing (Section 1.3)
Biological theme: Foraging in a patch environments, 1(Two prey diet choice problem)

9 January

Exponential Growth and Decay (Section 2.1)
Biological theme: Foraging in a patchy environment, 2 (Marginal value theorem)

12 January

Sequences (Section 2.2)
Biological theme: Pattern in biology

14 January

Limits (Section 3.1)
Biological theme: Michaelis Menten kinetcs

16 January

Continuity (Section 3.2)

19 January

Holiday

21 January

Limits at Infinity (Section 3.3)

23 January
Trigonometric Limits (Section 3.4)
Biological theme: Life tables

26 January
Continuous Functions (Section 3.5)

28 January
Definition of the Derivative (Section 4.1)
Biological theme: The logistic equation

30 January
Derivatives of polynomials (Section 4.2)

2 February
Product and quotient rules (Section 4.3)
Chain rule (Section 4.4)

4 February
Implicit differentiation, related rates and higher derivatives (Section 4.4)

6 February
Derivatives of Trigonometric Functions (Section 4.5)

9 February
Derivatives of Exponential Functions (Section 4.6)
Biological theme: Predator-prey dynamics

11 February
Derivatives of Inverse and Logarithmic Functions (Section 4.7)

13 February
Midterm [Through derivatives of trigonometric functions]

16 February
Holiday

18 February
Approximation and Local Linearity (Section 4.8)
Biological theme: Lotka-Volterra Competition Models

20 February
Extrema and the Mean Value Theorem (Section 5.1)

23 February

Monotoncity and Concavity (Section 5.2)
Biological theme: Growth, age and maturity in fish

25, 27 February
Extrema, Inflection Points and Graphing (Section 5.3)

1 March
Optimization (Section 5.4)

3 March
Putting It Together: Fishery Mathematics

5 March
L'Hopital's Rule (Section 5.5)

8 March
Difference Equations (Section 5.6)
Biological theme: Fluctuating environments

10 March
Newton's Method (Section 5.7)
Antiderivatives (Section 5.8)

12 March
Putting It Together: The Evolutionary Theory of Aging