

**Agnes Scott College**  
**Mathematics 117A, Functions and Modeling, Fall 2008**

*The meaning of these concepts I naturally could not yet grasp, but  
they acted on my imagination, instilling in me a reverence for mathematics  
as an exalted and mysterious science which opens up to its initiates  
a new world of wonders, inaccessible to ordinary mortals.*

SOFIA VASILYEVNA KOVALEVSKAYA (1850-1891)

*It is hard to fail, but it is worse never to have tried to succeed.*

THEODORE ROOSEVELT (The Strenuous Life)

**Instructor:**

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Class times: MTWF 11:00 – 11:50 a.m., Buttrick 217.

On selected Tuesdays (see schedule below), you will be expected to stay until 12:00 to write a test.

**Required Materials:**

*Functions Modeling Change, A Preparation for Calculus*, by Connally, Hughes-Hallett, Gleason, et al. (Second Edition, 2004)

The bookstore also has a Student Study Guide, and a Student Solutions Manual.

You will need a graphing calculator. We recommend the TI-83/84 family.

**Additional Reading:**

One copy of the Student Solutions Manual will be placed on reserve in the McCain Library, another in the Math Learning Resource Center (the LRC, in Buttrick G12).

*Trigonometric Delights*, Eli Maor, Princeton U. Press, 1998, is in the McCain Library.

There are lots of good Precalculus texts – you are invited to browse in alternate texts and read different approaches to what we are learning. Some texts, including sources for algebra and trig review, will be available in the Math Learning Resource Center (LRC).

**Network Resources:**

*Blackboard*                      <http://blackboard.agnesscott.edu>

The course page on *Blackboard* will contain announcements, copies of handouts, and other materials, and give you an opportunity to chat with each other. You are expected to access this resource, and your ASC email, regularly. Announcements on *Blackboard* are official.

**Course Description and Objectives:**

My goal for you is that this course will be a fresh start for you, a new and positive mathematical experience. It is designed to consolidate the background needed for a calculus course, to develop your ability to think independently and to problem-solve effectively, and to study mathematical modeling as a tool for applications in the sciences. It is assumed that you have good control of high school algebra skills. While many of the topics in this course are similar to those encountered in a high school precalculus class, the emphasis here is on conceptual understanding, problem solving, modeling and applications. The approach and style are consistent with that of the calculus courses we offer at Agnes Scott, so if your goal is to take calculus, this course should prepare you well.

<sup>1</sup> She is probably the greatest woman mathematician of the 19<sup>th</sup> century. For more, see the web site <http://www.agnesscott.edu/lriddle/women/women.htm>

## Course Description and Objectives (continued):

We will assume that you have learned some of the foundations about functions, and will skip over several sections early in the text. If you need to do review, you're a college student now, and need to take the initiative. You have a good text, and you can learn from it. Ask for guidance, but take responsibility. You are the only person who knows where you are lacking in background.

Calculus is the study of *change*, and so change will be a theme that runs through this course. In order to understand change (in the physical, biological or social sciences, and elsewhere), the essential tool is the idea of a *function*. Hence the title of this course: *Functions and Modeling*, and of the text: *Functions Modeling Change*. Keep this in mind as we proceed – you will often feel lost in the details, but seeing the big picture helps you get through.

The formal course description (see the catalog) reads:

"Polynomials, rational, exponential, logarithm and trigonometric functions in the natural and social sciences, with emphasis on their numerical, graphical and algebraic properties and their application and use in modeling real-world situations."

You might think, "*How absolutely boring! I did this all in 12<sup>th</sup> grade!*" Or possibly, "*ugh! This was so hard – I'm in for a tough time!*" But read the quote from Sofia Kovalevskaya<sup>1</sup> - she is reflecting on her thoughts when she was about 17 years old, and first saw some of the things you will be studying. Hopefully, you will experience some of that wonder – not boredom, and not anxiety. And hopefully, you will aspire to do your very best, and be open-minded about where your efforts might lead you. I will do what I can to enable you to do this.

### By the end of this course, you should:

- have a thorough understanding of the notion of a function, and an ability to work with polynomial, rational, exponential, logarithmic (log) and trigonometric (trig) functions;
- be able to use a graphing calculator effectively as a computational tool for solving problems;
- have an understanding of mathematical modeling that comes from the study of several real world applications;
- have improved your mathematical problem solving skills and algebraic manipulative skills;
- have an increased ability to use and trust your mathematical intuition;
- be able to read a mathematics text and to learn from your reading;
- be able to communicate mathematically (through writing and speaking);
- have an increased understanding of the importance of mathematics to you.

### Office Hours and Sources of Help:

- I will be available Tuesdays at 10 am in my office and will answer questions after class, as needed.
- Please develop collaborative relationships (study buddies) with others in the course. Research shows that those who collaborate get better grades in math courses!
- The Math *Learning Resource Coordinator*, Ms. Liz Hartnett, and student *Learning Assistants* (LA's) will be available to support your learning several hours each week. You are encouraged to spend time in the LRC on a regular basis, working on your own or with others. You should think of this time as part of your weekly math study, knowing that if you get stuck, need a nudge, want to just chat, that someone is there to share

that chatting or to do that nudging. More details will be provided, the LRC schedule is posted widely in Buttrick and on *Blackboard*. The Math LRC is located in Buttrick G12.

- Learning assistants for this course will also be available at the drop-in sessions in the Chemistry Learning Support Center on Wednesdays and Sundays, from 6:00 to 8:00 p.m. in the Science Center 304W. These open study hours are a collaboration between mathematics and chemistry for students in CHE 101, MAT 117 and MAT 118. More details later. So this should be particularly useful if you are in a CHE 101 as well as MAT 117.
- The course page on *Blackboard* will contain announcements, copies of handouts, and other materials, and give you an opportunity to chat with each other. You are expected to access this resource, and your ASC email, regularly. Announcements on *Blackboard* are official.

### Grading (assessment):

Your final grade will be computed as follows: Note that the final exam is really important!

	Total points	Percentage of final grade
Warm-up quizzes	30 points	6%
Problem sets	120 points	24%
Participation	30 points	6%
Three midterm tests:	220 points	44%
Final Exam:	100 points	20%
<b>Total:</b>	<b>500 points</b>	<b>100%</b>

I use a ten point scale, using + and – as appropriate. So 90% guarantees you an A –, 80% a B –, 70% a C –, and 60% a D –.

### Assignments and Class Participation:

- **Reading:** Learning how to read a mathematical (or any technical) text is quite hard. Your text book is much more than a source of problems. You are expected to read the relevant sections from the text both ahead of each class, and again after the material has been discussed. You should also take coherent notes in class, do your homework daily, and study the material we did in class critically. In-class warm-up exercises and discussion about the homework will help you to learn how to do this.

Sporadically, we'll have a two-minute unannounced quiz, where you will be asked to complete a card with a question on either the reading for that day, or what we did in the preceding class. These will be graded on a scale of 0 to 5. Your six best scores will count. **(30 points or 6%).**

- **Daily homework:** You cannot expect to learn mathematics and develop your problem solving skills if you do not practice! After every class, you will have assigned problems to try, and you are expected to do this work (almost) daily, even though no one may ever check this. Get into the habit early. Do all of it if you can, but if not, do most of it, selecting the harder problems too. Keep track of what you've done.

Find collaborators (study buddies), and if you haven't found one after a few days, let me help you do so! Organize your homework (write page #'s, date, essential tracking details), and keep a list of where you are not sure of your solutions. Then bring your buddy and/or your list to the LRC comes in! But most of this work will never be checked. You are in college now, and the responsibility of determining if you have *really* mastered the homework rests on you. Post your questions about homework in Blackboard and I will answer them. That way you have more access to my help and you will help others learn from where you were stuck.

As you work, be vigilant for your algebraic and manipulative skills and weaknesses. This is not an algebra course, and you are expected to have good algebraic skills. The text has **Tools** sections at the end of several chapters. Look at these early in the course, and use this resource to hone your algebra skills. Optional tools workshops will be scheduled if there is sufficient demand (on Thursdays at 11:00).

- **Problem Sets:** I will collect approximately two problems sets for each test. They are **due on either Tuesday or Friday**. The problems will be representative of the more challenging work you should be doing in the daily homeworks, and the problems to turn in will be **announced a couple of days before**, either in class or on *Blackboard*. **Note that I will give almost no credit for an answer without either sufficient work or an explanation, or both!** I am very concerned with the reasoning behind your answer. For example, if you set an expression equal to 0 and solved, tell me *why* you did that.

The work you turn in must be written by you alone. Do not copy from work you did with others. Instead, after working with others, write up your own solution, without looking back at the group work. Your solution must reflect your own understanding, use your own language, and must be pledged. Your pledge tells me that you have met these standards.

If you keep your homework organized and do it regularly, this part will be easy. If you try to do only the minimum problem set to turn in, you will be cheating yourself, and you will fall behind. The problem sets will **not** be accepted late. They will be read carefully, and graded with an A/B/C/U. Work will be returned to you within a week. You are encouraged to come chat, sort out what went wrong, and then redo the work.

Corrections and responses to my comments are due with the next problem set or on the day of the next Test, whichever comes first. If this is well done, your grade may increase by up to one letter (say from a B– to an A– or a U to a C). Corrections will be accepted only if accompanied by the first attempt (even if it's a U).

The 120 points will be allocated as follows: Each A will give you 20 points, each B will give you 15 points, each C will give you 10 points. A grade of U does not count; it may mean that you completely missed the point, or didn't understand the work well enough. This scale should tell you that a bunch of C's is barely passing, not a strong record of progress, and that turning in every problem set is in your best interests. **(120 points total or 24% of the final grade.)**

- **Participation** involves your contribution to the atmosphere of the class. Your attitude, regular attendance and punctuality, questions about the homework problems, and your willingness to contribute ideas and to be a contributing partner in collaborative efforts, all count. It also includes evidence that you have done the reading for class, and have attempted the vast majority of the problems and exercises that you should be doing daily. On test days, I will enter my current estimate of your participation grade into Blackboard. Your subsequent participation may cause the grade to go up or down. **(30 points or 6%).**

Also, the completion of course evaluations is an expectation of students in this class. Near the end of the semester you will be notified by e-mail and provided with a link to follow to complete the evaluations online outside of class.

You are also encouraged to participate in the Mathematics Department's Problem of the Week, which is available at <http://math.agnesscott.edu/mathdept/potw/index.html>. Attempting these problems, usually fairly elementary in their prerequisite background, will add to your experience in solving problems, should be a lot of fun, and – well, you might win a cash prize!

In summary, if you do the reading, keep up to date with your homework problems, use the resources we offer to help you when you are struggling, and participate effectively, everything else should go smoothly



## Tests:

- There will be three **tests**, and a cumulative **final exam**. Each test will be a timed, 60 minute closed book test. My plan is that they will all be held on Tuesday in class. The final exam is a two and a half hour test. Together, these count 64% of your total grade, which is huge! Of the 220 points on the three tests, your scores will be weighted 85:75:60 so that your best score on the three tests is weighted most, your lowest score least. This gives you an opportunity to recover from a poor test.

This schedule for the tests is fairly firm. Let me know early if you find a major conflict.

First test: Tuesday September 23 (in class, from 11:00 a.m. to 12:00 p.m.).

Second test: Tuesday October 21 (in class, from 11:00 a.m. to 12:00 p.m.).

Third test: Tuesday November 18 (in class, from 11:00 a.m. to 12:00 p.m.), before Thanksgiving.

## Academic Integrity:

You are expected to pledge all your work turned in to me. But even in your own work, which nobody sees, you need to make sure that you are in control, that you are not merely regurgitating what others (study buddies, LA's, a professor) have said or written, but that your work reflects your own understanding of the material. Acknowledge ideas of others (as you would a text or web page in a writing-intensive course).

In all your work, even though you may have collaborated with others, your written solutions must be your own, and should represent your personal understanding and writing style. When you pledge your work, you are pledging that you have followed all these guidelines.

**A very rough layout<sup>2</sup> for the material in the text,  
and the schedule for Problem Sets and Tests**

Week	Dates	Monday	Tuesday	Wednesday	Friday
1	8/25-8/29			<b>Classes begin</b> 1.1	1.3
2	9/01-9/05	<b>Labor Day</b>	1.4 Problem Set # 1 out	1.5	2.1 <b>Problem Set # 1 due by 11 am</b>
3	9/08-9/12	2.2	2.3	1.2	2.5 Problem Set # 2 out
4	9/15-9/19	2.6	3.1 <b>Problem Set # 2 due by midnight</b>	3.2	3.2, 3.3
5	9/22-9/26	3.3 Review session at 6:00 p.m	<b>First test in class 11:00 – 12:00 Covering weeks 1-4</b>	3.4	2.4 Problem Set # 3 out
6	9/29-10/03	4.1	4.1, 4.2 <b>Problem Set # 3 due by midnight</b>	4.2 <b>Last day to drop without a W</b>	4.3 <b>Black Cat</b>
7	10/06-10/10	5.1	5.2 Problem Set # 4 out	5.3	5.4 <b>Problem Set # 4 due by 11 am</b>
8	10/13-10/17	5.5	6.1	6.2	<b>Fall break</b>
9	10/20-10/24	6.3 Review session at 6:00 p.m	<b>Second test in class 11:00 – 12:00 Covering weeks 5-8</b>	6.4	6.5 Problem Set # 5 out
10	10/27-10/31	6.5, 6.6	6.6 <b>Problem Set # 5 due by midnight</b>	7.1 <b>Last day to drop with a W</b>	7.2
11	11/03-11/7	7.3	8.1 Problem Set # 6 out	8.3	8.2 <b>Problem Set # 6 due</b>
12	11/10-11/14	8.2, 6.7	6.7	Review	9.1
13	11/17-11/21	9.2 Review session at 6:00 p.m	<b>Third Test in class, 11:00 – 12:00 Covering weeks 9-12</b>	<b>Thanksgiving</b>	<b>Break</b>
14	11/24-11/28	9.3	Functions $1/x$ and $1/x^2$	9.4	9.5
15	12/01-12/05	9.6	Graded group problem sets in class	Graded group problem sets in class	Graded group problem sets in class
16	12/08-12/12	Review <b>Last class</b>	<b>Reading</b>	<b>Days</b>	<b>Exams</b>

<sup>2</sup> This is not intended to be binding. Flexibility is important because I must be responsive to your needs.