

Math 170

Functions, Data, and Models

Syllabus, Spring term 2014

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Learning objectives

By the end of the course, students will be able to do the following.

Problem Solving

- Solve problems presented in the context of real world situations by creating, manipulating, and interpreting function models.
- Possess a personal framework of problem solving techniques (e.g., read the problem at least twice, define variables, sketch and label a diagram, list what is given, restate the question asked, identify variables and parameters, use analytical, numerical and graphical solution methods as appropriate, and determine plausibility of and interpret solutions).

Functions and Equations

- Identify, describe, and use functions and rates of change.
- Effectively use and translate among symbolic, numeric, graphic, and verbal representations of functions.
- Recognize and use symbolic, numeric, graphic, and verbal representations of linear, exponential, power, polynomial, logarithmic, and periodic functions.
- Recognize and use standard transformations (i.e., translations, dilations, contractions, and reflections) with symbolic, numeric, graphic, and verbal representations of functions.

- Use algebraic techniques and manipulations necessary for problem-solving and modeling (e.g., applying the same operation or function to both sides of an equation, factoring quadratic polynomials, completing the square, quadratic formula, solve system of linear equations, and use trigonometric identities).

Data Analysis

- Collect (in scientific discovery or activities, or from the Internet, textbooks, or periodicals), display, summarize, and interpret data in various forms.
- Apply algebraic transformations to linearize data for analysis.
- Fit an appropriate curve to a scatter plot and use the resulting function for prediction and analysis.
- Determine the appropriateness of a model via scientific reasoning.

Technology

- Use software to explore concepts and solve problems (e.g., graph functions, graph parametrically defined relations, investigate standard transformations, solve equations and inequalities, and fit function models to data).
- Recognize when software may provide incorrect, misleading, or incomplete results.

Learning

- Learn mathematics by anticipatory reading, listening, conversing, asking and answering questions, exploring, critical thinking, completing exercises, solving problems, reviewing, and assessing self and others.

Attitudes and Beliefs

- View the learning of mathematics as important, interesting, enjoyable, collaborative, and a sense making process.

Placement advice

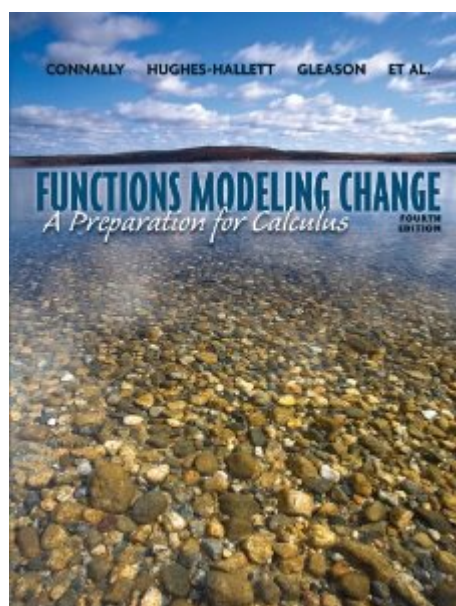
All students need to meet the mathematics competency or quantitative literacy requirement. This can be done with a SAT math score of 550 or higher, an ACT score of 23 or higher, college credit in a 100 or higher level (including Math 170) mathematics course, a passing score (60% or higher) on the Goshen College math competency exam, or passing Math 105.

Math 170 will meet this requirement and is especially useful for students who want to understand how mathematics is used to model the world, plan to take calculus, and/or plan to major in the natural or social sciences.

Course resources and materials

- **Required:** Purchase access to the **WileyPlus course** at <http://edugen.wileyplus.com/edugen/class/cls369519/>. This includes online access to the *Functions Modeling Change* (Connally, et.al.) textbook (about half the price of buying the physical book), and the WileyPlus homework system for class assignments.

Optional: Hardcover, paperback, and binder ready versions of the textbook are available for purchase or rental for those students who would like to have a physical book.



- **Required: Wolfram Alpha app.** This paid app is available on your GC-registered iPad **for free** if you go to the [GC App Catalog | Purchased section](#). Get the app, but this is also available as a web service at: <http://wolframalpha.com>. We will also use Wolfram *Mathematica*, but this is available on GC lab computers.
- **Recommended:** A one-inch three-ring **binder** with loose-leaf lined and graph paper is recommended so that you can keep printed copies of course resources and a written record of problem solving attempts, questions, math concept and technique discoveries, and skill assessments.
- **Mathematica** is available to you on GC lab computers and will be used in the lab sessions
- **Class website:** with a general schedule, course documents, lecture notes.

Bookmark:

goshen.edu/physix/170/#today (computer)

-or-

goshen.edu/physix/170/again/schedule.php#today (iPad).

- **Grades:** and other course material on moodle.goshen.edu.
- **E-mail:** read your ____@goshen.edu e-mail or **forward it** to your favorite e-mail service.

Instructors

Lectures: MWF, 1 pm, SC 107

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Lab: R, 2:00 - 3:15 pm, NC 12

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Coursework

Grading

minimum grade outcomes:

A/A- 93%/90

B+/B/B- 87%/83/80

C+/C/C- 77%/73/70

D+/D 67%/60

F < 60%

I *may* adjust this scheme down a bit (e.g. 89% might end up being good enough for an A), but I certainly won't adjust it up.

Assignments 25%

Labs 25%

Exams (*) 10% × 3 = 30%

Final exam 18%

Participation 2%

Grades are intended to reflect the degree to which the mathematical content has been mastered - not the performance of one student in relation to others.

Assignments

Achieve and exhibit understanding by completing exercises daily. These are handled in WileyPlus. Recommendations:

- Solve each exercise on paper before submitting your answer online.
- If at first your answer is marked incorrect, determine the error in your thinking, and submit a revised answer without penalty.
- You are welcome, and indeed encouraged to work together. But try to be talking and discussing as much as everyone else in your group. Make sure you could solve similar problems on your own. Take turns 'leading out' with your solution.

Labs

- Apply your understanding to more open ended and applied exercises.
- Make effective use of software to explore concepts and solve problems.
- Practice communicating quantitative ideas in writing.

Labs will generally be *started* during class, but will require time outside of class to complete. Lab reports will be completed by groups of one to three students.

Exams

Exhibit your mastery of the learning objectives without assistance or collaboration. There may be both in-class and take-home portions for each exam.

There will be 3 exams during the semester, and one final exam. (*) Your **lowest midterm exam grade will be replaced** with your final exam grade before calculating your final semester grade.

Participation *and initiative*

This comprises class attendance and your instructor's subjective evaluation of your participation in activities. But it also includes pro-active actions that you take when you encounter difficulties: consulting with peers, instructor or tutors, and taking the recommended steps to identify areas for improvement.

Policies

To get an *average* grade in a 4-credit hour course, an *average* student should expect to spend 2-3 hours outside of class for every hour in class, that is, approximately 10 hours/wk in addition to class time.

Academic Resource & Writing Center

Goshen College wants to help all students be as academically successful as possible. **If you have a disability and require accommodations**, please contact Lois Martin, the Director of the ARWC early in the semester. In order to receive accommodations, documentation concerning your disability must be on file with the Academic Resource & Writing Center, Good Library 113, x7576, lmartin@goshen.edu. All information will be held in the strictest confidence.

The Academic Resource and Writing Center offers **tutoring and writing assistance for all students**. For further information please see goshen.edu/studentlife/arwc.

Collaboration & Integrity

You are encouraged to use all available resources in order to learn the concepts and techniques discussed in this course. In particular, conversations with other students and the instructor can be an effective learning method. Reading other books and web pages can be another effective learning method. However, copying someone else's work subverts the learning process.

For assignments, you may look at and discuss another student's work, but any written work developed during collaboration with another student should be destroyed before writing your own solutions. Give written acknowledgement to people with whom you have had discussions and to any written materials (other than the text) that were helpful.

For exams, you may not use any resources unless a specific exception is stated by the instructor.

Failure to observe the above rules will result in a penalty ranging from a zero on the assignment or exam to immediate failure of the course. Any violation of academic integrity will be reported to the Academic Dean.

Observation of the above rules will result in the satisfaction of knowing that you have earned your grade.

Attendance

You are expected to attend class every day and to actively participate in class activities. You are expected to come prepared. This means that you should have read the book and be prepared to ask questions about the reading and the problems you are asked to do. You should be prepared to do problems and take part in class discussions and in class problem solving. These aspects are reflected in the 'participation' part of your semester grade.

See the page on [math-dō](#), *The way of math* for additional concrete suggestions.

Due dates

Assignments, labs, and exams can only be rescheduled or made up if (1) there is a serious medical problem, a death in the immediate family, or an irreconcilable conflict with another official Goshen College activity; (2) there is written documentation signed by proper authorities; and (3) the instructor is notified prior to the due date or as soon as possible afterwards.

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