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, fitting, 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.
- 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, logarithmic, power, and polynomial 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).

Data Analysis
- Collect (in scientific discovery or activities, or from the Internet, textbooks, or periodicals), display, summarize, and interpret data in various forms.
- 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., describe data, graph functions, solve equations, and fit function models to data).
- Recognize when software may provide incorrect, misleading, or incomplete results.

Learning and Communication
- Learn mathematics by anticipatory reading, listening, conversing, asking and answering questions, exploring, critical thinking, completing exercises, solving problems, reviewing, and assessing self and others.
- Communicate mathematical ideas clearly in oral and written form.

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

Instructor
David Housman, SC 117, dhousman@goshen.edu, 574-535-7405, 574-612-7185 (cell). Office hours will be posted on Moodle.

Class
Seven Tuesdays, 5:30 – 9:30 PM in SC 107.
Texts


On-line

Moodle (https://moodle.goshen.edu) will be used for submitting assignments and posting course resources and grades. News and Questions and Answers forum postings will be emailed to students’ Goshen email addresses—make sure you check your email regularly.

Technology

Excel, WolframAlpha (www.wolframalpha.com), and scientific calculators are useful tools for computation, visualization, and exploration. WolframAlpha is a free web resource and Excel is available free on Goshen College networked computers. A scientific calculator (with keys for trigonometric, exponential, and logarithmic functions) without graphing or programming capabilities may be used when taking the final exam. The Casio® FX-260 Solar Scientific Calculator, which retails for about $10, is one possible choice.

Notebook

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.

Activities

The study of mathematics is not a spectator sport! Reading, listening, solving problems, writing explanations, reflecting upon ideas, assessing skills, and receiving feedback are essential to learning mathematics. A student with average preparation (B grades in high school algebra and geometry and 500 Math SAT) can obtain an average grade (C+ to B−) with an average of eighteen hours each week (including class time) devoted to this course—adjust if you are not average or desire a grade that is not average.

For each section, start by reading the text in an anticipatory fashion. This means for each example, (1) cover the solution with a piece of paper before the solution is described, (2) think and write your own solution, and only then (3) read the authors’ solution focusing on the parts you did not already obtain on your own.

If you do not understand some aspect of the text, write a question that is as specific as possible. Sometimes writing the question is enough to spark the insight needed for you to answer your own question. Otherwise, you will be compiling a list of useful questions to ask peers, tutors, and/or the instructor.

While or after reading a section, try some of the exercises that have answers near the back of the text.

During class, actively listen, engage in activities, share understandings with peers, and ask your unanswered questions.

After reading the text, doing some of the exercises with answers, and participating in class, you should be ready to complete the assignment for a grade. If needed, seek assistance from peers, tutors, or the instructor. Read the feedback from the instructor when a perfect score is not achieved. Throughout these activities, try to articulate your concept discoveries and assess your skills by describing strengths, improvement areas, and insights.

As you accumulate conceptual knowledge and acquire skills over several days, you will be asked to synthesize and apply those concepts and skills by completing labs and taking exams.
Grading

Course grades will be based on performance in the following activities.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignments (6, weekly)</td>
<td>10%</td>
</tr>
<tr>
<td>Labs (4, each worth 10%)</td>
<td>40%</td>
</tr>
<tr>
<td>Exams (3, each worth 10%)</td>
<td>30%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>20%</td>
</tr>
</tbody>
</table>

The score for each activity is capped at 100. If helpful, the final exam grade will replace the minimum of the exam grades. The course grade will be capped at the final exam grade plus twenty. The course grade will be translated into letter grades in the following manner.

<table>
<thead>
<tr>
<th>Minimum Percentage</th>
<th>93</th>
<th>90</th>
<th>87</th>
<th>83</th>
<th>80</th>
<th>77</th>
<th>73</th>
<th>70</th>
<th>67</th>
<th>60</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Letter Grade</td>
<td>A</td>
<td>A-</td>
<td>B+</td>
<td>B</td>
<td>B-</td>
<td>C+</td>
<td>C</td>
<td>C-</td>
<td>D+</td>
<td>D</td>
<td>F</td>
</tr>
</tbody>
</table>

Assignments

Achieve and exhibit understanding by solving problems regularly. At minimum, there will be a weekly assignment of problems for which written solutions will be due 24 hours before the next class. Since achieving understanding is one goal for solving problems, you should feel free to collaborate with and seek assistance from other students, tutors, the instructor, and other experts. After receiving assistance, make sure you could solve similar problems on your own. If you cannot solve a particular problem, include questions that will help the instructor guide you to a solution and mastery of the concepts. Grades will take into account such good faith efforts as well as actual performance. A diligent student should obtain A and B grades on each assignment.

Exams

Exhibit your ability to solve problems presented in the context of real world situations by creating, fitting, manipulating, and interpreting function models in well-defined contexts and without assistance or collaboration. The regular exams will be completed outside of class under a time constraint. The final exam will be completed during the last class.

Labs

Exhibit your ability to synthesize and apply knowledge obtained from the text, class, and assignments.

Tentative Schedule

This schedule is tentative. See Moodle for the final schedule and details for all activities.

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Sections</th>
<th>Due Next Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Data</td>
<td>1.1-3</td>
<td>A1, Lab1</td>
</tr>
<tr>
<td>2</td>
<td>Functions</td>
<td>2.1-4</td>
<td>A2, Exam1</td>
</tr>
<tr>
<td>3</td>
<td>Linear Functions</td>
<td>3.1-4</td>
<td>A3, Lab2</td>
</tr>
<tr>
<td>4</td>
<td>Exponential Functions</td>
<td>5.1-3</td>
<td>A4, Exam2</td>
</tr>
<tr>
<td>5</td>
<td>Log and Power Functions</td>
<td>5.4-8</td>
<td>A5, Lab3</td>
</tr>
<tr>
<td>6</td>
<td>Polynomial Functions</td>
<td>6.1-3</td>
<td>A6, Lab 4, Exam3</td>
</tr>
<tr>
<td>7</td>
<td>Review and Final Exam</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Due Date Policy

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.
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 Academic Resource & Writing Center 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 112, x7576, lmartin@goshen.edu. All information will be held in the strictest confidence. The Academic Resource & Writing Center offers tutoring and writing assistance for all students. For further information see http://www.goshen.edu/campuslife/arwc/.

You are encouraged to use all available resources in order to learn the concepts and techniques discussed in this course. In particular, face-to-face and electronic 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. You should give written acknowledgement to people with whom you have had discussions and to any written materials (other than the text) that were helpful.

For labs and 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 zero on the assignment, lab, or exam. Any violation of academic integrity will be reported to the Associate Academic Dean.

Observation of the above rules will help you learn the material well and give you the satisfaction of knowing that you have earned your grade.

All Goshen College students need to establish quantitative literacy competency. This can be done with a SAT math score of 550 or higher, an ACT math score of 23 or higher, college credit in a 100 or higher level mathematics course, a passing score (60% or higher) on the Goshen College math/quantitative literacy competency exam, or passing Math 105. If you are unlikely to take more math courses, Math 105 Quantitative Reasoning or Math 115 Applied Algebra is a good course to take.

If you plan to take more mathematics courses (say, you want to major in business or science), then you should think about Math 141 Finite Mathematics (a good course for business majors) or Math 170 Functions, Data, and Models (a good course for science majors). Math 115 can now be used to meet the business major mathematics requirement.

Students who matriculated before 2012 must meet a mathematics and science general education requirement. Math 105 and Math 115 do not meet this requirement. However, Math 141 or Math 170 would count. It is also possible to meet this requirement by taking no additional math course (e.g., by taking Biol 100 and Phys 100).