

MATH 110

Algebra

General Description

Introduction

MATH 110 is a college algebra course designed to provide you with the fundamental skills that are necessary for success in all subsequent math courses offered at UNC-Chapel Hill. We will emphasize the study of polynomial and rational functions, exponential and logarithmic functions, and solving equations and inequalities. An important purpose of this course is to strengthen your skills in basic algebra and in the manipulation of functions. We will also help you develop your ability to describe the general and specific behavior of a given equation or function by graphing. Perhaps most importantly, this course will help you strengthen your problem-solving skills in a variety of mathematical contexts.

There are no college prerequisites for MATH 110. However, this course assumes that you have completed the equivalent of high school Algebra I and II and Geometry.

The course is organized into four main units of study, covering Chapters R through 6 in the textbook.

- Unit 1 introduces you to the fundamentals of **solving equations**.
- Unit 2 introduces you to the fundamentals of **graphing equations and functions**.
- Unit 3 asks you to apply these fundamental skills to **more complicated equations and graphs**.
- Unit 4 introduces you to two special types of functions, **exponential and logarithmic functions**, and their applications.

Each unit is followed by a closed-book test.

These units are broken down further into a total of 18 lessons. Each lesson presents learning objectives as well as a discussion section that highlights the main ideas and problem-solving techniques at work in the lesson. Most lessons also include numerous sample problems that supplement the text examples to help prepare you for the written exercises, quiz problems, and test items.

Course Materials

The text required for MATH 110 is *College Algebra*, 8th edition, ISBN-13 978-0136154341, by Michael Sullivan. You may purchase the text from Friday Center Books & Gifts using the book order form in this manual or online at <https://s4.its.unc.edu/HigherGrounds>.

You will need a **basic scientific calculator** for this course.

Lecture Notes

The lecture notes included in this manual have been written to help make up for the fact that you will not be attending weekly lectures yourself. These notes are not meant to replace the textbook's presentation and explanation of the course topics. Rather, you should use the notes as a resource for strengthening your understanding of these topics. One of my goals in writing these notes has been to highlight main ideas and unifying concepts in more conversational language. Also, I have tried to help you recognize how these ideas and concepts interact with each other as you work through the lessons. Finally, the lecture notes point out when certain topics discussed in the text are not included as part of the MATH 110 syllabus.

Sample Problems

The sample problems included in this manual are meant to supplement the textbook's examples. I have tried not to duplicate the textbook examples so as to provide you with the widest possible variety of problems that demonstrate how the lesson's main ideas come together in a problem. The level of difficulty of the sample problems ranges from medium to hard. In other words, if you can understand the sample problems and textbook examples, then you will be well-prepared for any homework, quiz, or test item. Don't neglect the textbook examples!

Practice Problems

I know that I'm not the first person to tell you this, but it certainly bears repeating: The only way to master the important ideas in a math course is through **practice, practice, practice!** And this course is certainly no exception. That's why each lesson contains a list of practice problems that have been selected from the written exercises at the end of each section. It will be **impossible** (or at least really, really, really, really difficult) to pass this course without doing **all** of the practice problems. I have carefully chosen exercises that will hone the skills you will need for success in all subsequent math courses at UNC. I promise you that this list is not "busy work." You owe it to yourself to attempt, and more importantly, to understand, each practice problem before you work on the quizzes or unit tests. You will **not** submit these problems for grading. However, your test grades will certainly depend on your dedication to the homework lists.

Quizzes and Tests

The written work that you must submit for grading will be in the form of thirteen quizzes and four unit tests.

The **quizzes** occur after every one or two lessons and consist of problems that are representative of the practice problems. Each quiz is worth 20 points, and usually consists of four or five problems. Although there is no time limit for the quizzes, they have been designed to require between 15 and 20 minutes to complete. **Your three lowest quiz scores will be dropped.** The remaining ten quiz scores count for 10 percent of your course grade. When taking a quiz, you may use your textbook and lecture notes (although I recommend that you first try to work each quiz without them).

The **unit tests** occur after each unit. Each test is **closed-book (and closed-notes)** and is worth 100 points. Each test counts for 15 percent of your course grade. Although there is no time limit for the tests, they have been designed to require 90 minutes to complete.

You may use a basic scientific calculator on all assignments. In fact, some problems will be impossible without one. However, you **may not** use a graphing calculator on any quiz or test problem that requires graphing.

Study Suggestions

As mentioned above, this manual is meant to supplement your textbook's explanation of the course topics. In particular, I strongly advise **against** your plunging right in to the written work before you read the notes for a given lesson. The following is a list of learning strategies that should make your study efforts more productive:

1. Carefully read the Lesson Objectives and Lecture Notes in this manual as you begin each lesson. Pay special attention to **main ideas**.
2. Carefully read the textbook sections for the lesson at hand. Refer back to your lecture notes where necessary.
3. Carefully study the manual's Sample Problems and the textbook's examples together. Remember that these examples provide you with the best collection of models for the practice problems, quiz, and test items. As you study these problems, try to recognize how the lesson's main ideas come together.
4. Now you are ready to attempt the practice problems. Once again, refer back to your notes and examples if you get stuck. You can check your work on the odd-numbered exercises by consulting the back of your textbook (or the *Students Solution Manual*). Remember, you should **not** submit these exercises for grading.
5. Carefully review the graded assignments (quizzes) when they are returned to you. It is essential that you master each lesson before you proceed through the course, because each subsequent lesson builds upon the skills and ideas presented earlier in the course. The Chapter Review exercises in the textbook also serve as an excellent source for additional practice.

As you prepare for the unit tests, you should also consult the Study Outline that appears at the end of each chapter in the textbook. I cannot overemphasize how important it is for you to try to **put the main ideas in each lesson into language that makes sense to you**.

Final Exam and Grading

Along with the tests and quizzes, you must also complete a cumulative final exam in this course that counts for 30 percent of your course grade. It will be supervised and will cover all topics presented in the course. You will have three hours to complete the final exam. Also, you must pass the final exam to pass the course. Finally, as a general rule, your final course grade may exceed your exam grade by no more than one letter grade.

Your final course grade will be determined as follows:

course grade =

$$\begin{aligned} & 0.10 \times (\text{Quiz Average}) \\ & + 0.15 \times (\text{Test 1} + \text{Test 2} + \text{Test 3} + \text{Test 4}) \\ & + 0.30 \times (\text{Final Exam}) \end{aligned}$$

Special Note: Your score on the final exam will replace your lowest test score, provided of course that your final exam score is higher than your lowest test (or quiz average). For example, if your test scores are: 65, 78, 84, and 90 (quiz average), with a final exam score of 80 percent, then your test scores become 80, 78, 84, and 90. Then your course grade is computed according to the above formula.

List of Lessons

- Unit 1: Constructing and Solving Equations
 - Lesson 1 Factoring Polynomials and Rational Expressions
 - Lesson 2 Radicals and Fractional Exponents
 - Lesson 3 Constructing and Solving Linear Equations
 - Lesson 4 Quadratic Equations
 - Lesson 5 Radical and Other Types of Equations
 - Lesson 6 Solving Inequalities
- Unit 2: Graphing Equations and Functions
 - Lesson 7 Plotting Points and Graphing Equations
 - Lesson 8 Lines
 - Lesson 9 Circles
 - Lesson 10 Functions and Their Graphs
 - Lesson 11 Graphing by Transformations
- Unit 3: Analyzing Complicated Functions
 - Lesson 12 Combining and “Undoing” Functions
 - Lesson 13 Building Functions
 - Lesson 14 Graphing Quadratic Functions

Lesson 15 Graphing Rational Functions
Unit 4: Exponential and Logarithmic Functions
Lesson 16 Exponential Functions
Lesson 17 Logarithmic Functions
Lesson 18 Exponential Growth and Decay