This course supports the assessments for QOT2. The course covers 7 competencies and represents 1 competency units.

**Introduction**

**Overview**
This study of college algebra is intended to provide a solid foundation of algebraic concepts and their applications to real-world problems. This algebra foundation will prepare you for the study of higher mathematics of calculus and beyond. You will learn the relevance and application of mathematical computation and problem solving to real-life situations in areas such as business, science, and economics. You should be able to confidently answer students who ask, "When will we ever use this?"

**Competencies**
This course provides guidance to help you demonstrate the following 7 competencies:

- **Competency 209.2.1: Knowledge of Numbers and Operations**
  The graduate demonstrates computational proficiency, including a conceptual understanding of numbers, ways of representing numbers, relationships among number and number systems, and meanings of operations.

- **Competency 209.2.2: Equations and Inequalities**
  The graduate solves and graphs linear and quadratic equations and inequalities.

- **Competency 209.2.3: Polynomials**
  The graduate identifies roots of polynomial functions and uses characteristics of polynomials as an aid to graphing.

- **Competency 209.2.4: Conic Sections**
  The graduate identifies and analyzes important characteristics of conic sections and graphs them.

- **Competency 209.2.5: Functional Analysis**
  The graduate explores, analyzes, and represents patterns, relations, and functions, including absolute value, radical, logarithmic, exponential, polynomial, and rational functions and their graphs.

- **Competency 209.2.6: Inverse Functions**
  The graduate demonstrates a conceptual understanding of and finds the inverse of a function.

- **Competency 209.2.7: Algebraic Modeling**
  The graduate appropriately defines functions in order to model and analyze change.

**Teaching Dispositions Statement**
Please review the [Statement of Teaching Dispositions](#).

**Course Mentor Assistance**
As you prepare to successfully demonstrate competency in this subject, remember that course mentors stand ready to help you reach your educational goals. As subject matter experts, mentors enjoy and take pride in helping students become reflective learners, problem solvers,
and critical thinkers. Course mentors are excited to hear from you and eager to work with you.

Successful students report that working with a course mentor is the key to their success. Course mentors are able to share tips on approaches, tools, and skills that can help you apply the content you're studying. They also provide guidance in assessment preparation strategies and troubleshoot areas of deficiency. Even if things don't work out on your first try, course mentors act as a support system to guide you through the revision process. You should expect to work with course mentors for the duration of your coursework, so you are welcome to contact them as soon as you begin. Course mentors are fully committed to your success!

Preparing for Success

The information in this section is provided to help you become ready to complete this course of study. As you proceed, you will need to be organized in your studies in order to gain competency in the indicated areas and prepare yourself to pass the final assessment.

Learning Resources

The learning resources listed in this section are required to complete the activities in this course. For many resources, WGU has provided automatic access through the course. However, you may need to manually enroll in or independently acquire other resources. Read the full instructions provided to ensure that you have access to all of your resources in a timely manner.

Enroll in Learning Resources

Take a moment to enroll in the learning resources listed in this section. To enroll, navigate to the “Learning Resources” tab, click the “Sections” button, and then click the “Enroll Now” button for each resource. Once your mentor approves your enrollment in the resource, you will receive an e-mail with further access instructions. Contact your mentor if you have questions.

Note: For instructions on how to enroll in or subscribe to learning resources through the “Learning Resources” tab, please see the “Acquiring Your Learning Resources” page.

Pearson MyMathLab

Enroll in MyMathLab to obtain the following e-textbook:


Additional Preparations

Purchase a Graphing Calculator

Acquire a graphing calculator and familiarize yourself with how to use it. Refer to WGU Calculator Guidelines for details regarding calculators that are acceptable on WGU exams. If you are in a secondary mathematics program, refer to WGU Calculator Recommendations for calculator suggestions for your degree program. If you are not in a secondary mathematics program, contact your mentor to discuss calculators appropriate to your degree program.

Fundamental Concepts of Algebra
This section contains a study of number sets and their properties. As you learn about these number sets you will also learn how to correctly use operations to combine numbers, and variables representing numbers, into algebraic expressions.

**Fundamental Concepts of Algebra**

In this topic we will review several important concepts that are necessary before advancing in through this course. You will study expressions, models, real numbers, and exponents.

This topic addresses the following competencies:

- Competency 209.2.1: Knowledge of Numbers and Operations
  The graduate demonstrates computational proficiency, including a conceptual understanding of numbers, ways of representing numbers, relationships among number and number systems, and meanings of operations.

**Number Theory**

Read the following section in *Algebra and Trigonometry* within MyMathLab:

- section P.1 ("Algebraic Expressions, Mathematical Models, and Real Numbers")

Complete the following MyMathLab exercises:

- Prerequisites 1

In your study notebook, describe the relationship between the natural numbers, whole numbers, integers, rational numbers, irrational numbers, and real numbers. A diagram might be an effective way to show the relationship between the different types of numbers. Can a real number be written as a fraction?

Review the following terms:

- number properties
- order of operations
- associative
- commutative
- distributive

**Scientific Notation**

Read the following section in *Algebra and Trigonometry* within MyMathLab:

- section P.2 ("Exponents and Scientific Notation")

Complete the following MyMathLab exercises:

- Prerequisites 2
In your study notebook, explain how decimals are shifted based on the positive or negative exponents on the base ten. Also, outline what types of real-world applications frequently make use of scientific notation. Further explain why scientists frequently need a notation for extremely small and large numbers.

**Equations and Inequalities**

An equation is a mathematical statement that expresses the relationship between quantities, both known and unknown. Known quantities are represented with numbers. Unknown quantities are represented with letters. Equations allow us to understand the mathematical relationship between the variables involved.

**Graphs and Linear Equations**

A linear equation is a special type of equation that contains two variables. The value of one of the variables depends on the value of the other. There are a variety of ways to find equations of lines. The particular technique you use will depend on the information you are given or the problem you are trying to solve.

This topic addresses the following competencies:

- Competency 209.2.2: Equations and Inequalities
  - The graduate solves and graphs linear and quadratic equations and inequalities.
- Competency 209.2.7: Algebraic Modeling
  - The graduate appropriately defines functions in order to model and analyze change.

**Linear Equations**

Read the following sections in *Algebra and Trigonometry* within MyMathLab:

- section 1.1 (“Graphs and Graphing Utilities”)
- section 1.2 (“Linear Equations and Rational Equations”)
- section 1.3 (“Models and Applications”)

Complete the following MyMathLab exercises:

- sections 1.1 to 1.3

In your study notebook, define a linear equation and describe the purpose and strategy for solving linear equations.

**Other Types of Equations**

In this section you will study a variety of methods for recognizing and solving nonlinear equations. You will study quadratic equations, polynomial equations, radical equations, equations with rational expressions, and equations that include absolute values.

This topic addresses the following competencies:

- Competency 209.2.2: Equations and Inequalities
  - The graduate solves and graphs linear and quadratic equations and inequalities.
Competency 209.2.7: Algebraic Modeling
The graduate appropriately defines functions in order to model and analyze change.

Quadratic Equations

Read the following sections in *Algebra and Trigonometry* within [MyMathLab](#):

- 1.5 ("Quadratic Equations")

Complete the following MyMathLab exercises:

- section 1.5

In your study notebook, describe the general strategy for solving quadratic equations? Know how to use a variety of methods (graphing, formula, or calculator) to solve these equations.

Other Types of Equations

Read the following sections in *Algebra and Trigonometry* within [MyMathLab](#):

- section 1.6 ("Other Types of Equations")

Complete the following MyMathLab exercises:

- section 1.6

In your study notebook, graph several absolute value equations on the same axis to see how they compare. How do you make the graphs narrower?

Inequalities

In this topic you will study how to solve linear inequalities and those with absolute value. You will need to review open and closed intervals and the definition of an absolute value.

This topic addresses the following competencies:

- Competency 209.2.2: Equations and Inequalities
  The graduate solves and graphs linear and quadratic equations and inequalities.
- Competency 209.2.7: Algebraic Modeling
  The graduate appropriately defines functions in order to model and analyze change.

Inequalities

Read the following sections in *Algebra and Trigonometry* within [MyMathLab](#):

- section 1.7 ("Linear Inequalities and Absolute Value Inequalities")

Complete the following MyMathLab exercises:
In your study notebooks, explain why the solutions of $|x| < a$ is a single bounded interval and the solutions $|x| > a$ are two unbounded intervals. Assume that $x$ is an algebraic expression and $a$ is a real number.

**Functions and Graphs**

A function is a specific type of relationship between two sets of numbers. In this section you will study the definition of a function and its applications. You will learn how to graph, transform, compose, and invert functions and how to use these tools to model real-world data.

**Function Basics**

A mathematical function is an equation that maps every $x$ value to exactly one $y$ value. In other words, each $x$ value must have a unique $y$ value. If there is an $x$ value that has two $y$ values then it is not a function.

This topic addresses the following competencies:

- Competency 209.2.5: Functional Analysis
  The graduate explores, analyzes, and represents patterns, relations, and functions, including absolute value, radical, logarithmic, exponential, polynomial, and rational functions and their graphs.
- Competency 209.2.6: Inverse Functions
  The graduate demonstrates a conceptual understanding of and finds the inverse of a function.
- Competency 209.2.7: Algebraic Modeling
  The graduate appropriately defines functions in order to model and analyze change.

**Basic Functions**

Read the following sections in *Algebra and Trigonometry* within MyMathLab:

- section 2.1 ("Basic of Functions and Their Graphs")
- section 2.2 ("More on Functions and Their Graphs")

Complete the following MyMathLab exercises:

- sections 2.1 and 2.2

**Linear Functions**

A linear function is an equation that describes a unique line. The equation can be written in multiple forms and can be translated from one form to another. By determining a point on the line and the slope of the line it can be easily graphed.

This topic addresses the following competencies:

- Competency 209.2.5: Functional Analysis
  The graduate explores, analyzes, and represents patterns, relations, and functions,
including absolute value, radical, logarithmic, exponential, polynomial, and rational functions and their graphs.

- Competency 209.2.6: Inverse Functions
  The graduate demonstrates a conceptual understanding of and finds the inverse of a function.
- Competency 209.2.7: Algebraic Modeling
  The graduate appropriately defines functions in order to model and analyze change

**Linear Functions and Slope**

Read the following sections in *Algebra and Trigonometry* within MyMathLab:

- section 2.3 ("Linear Functions and Slope")
- section 2.4 ("More on Slope")

Complete the following MyMathLab exercises:

- sections 2.3 and 2.4

**Additional Function Topics**

There are a number of operations that can be applied to functions. In this topic you will study how to transform a function (e.g. stretch a function), how to combine two functions together (e.g. add two functions), and how to invert a function. The inverse of a function is a new function that undoes the original function. All of this will be made clearer as you progress through the following topics.

This topic addresses the following competencies:

- Competency 209.2.5: Functional Analysis
  The graduate explores, analyzes, and represents patterns, relations, and functions, including absolute value, radical, logarithmic, exponential, polynomial, and rational functions and their graphs.
- Competency 209.2.6: Inverse Functions
  The graduate demonstrates a conceptual understanding of and finds the inverse of a function.
- Competency 209.2.7: Algebraic Modeling
  The graduate appropriately defines functions in order to model and analyze change

**Function Transformation**

Read the following section in *Algebra and Trigonometry* within MyMathLab:

- section 2.5 ("Transformations of Functions")

Complete the following MyMathLab exercises:

- section 2.5

**Function Composition**
Read the following section in *Algebra and Trigonometry* within MyMathLab:

- section 2.6 ("Transformations of Functions")

Complete the following MyMathLab exercises:

- section 2.6

**Inverse Functions**

Read the following sections in *Algebra and Trigonometry* within MyMathLab:

- section 2.7 ("Inverse Functions")

Complete the following MyMathLab exercises:

- section 2.7

In your study notebook, describe the concept of an inverse function and how to draw the inverse from a graph. Explain whether a one to one function always has an inverse. Describe when the vertical and horizontal line tests are used.

**Polynomial and Rational Functions**

Polynomials are typically characterized by their degree--that is, the highest power of the variable. In this subject you will examine several types of polynomial and rational functions and learn how to manipulate (e.g. divide) and graph these functions.

**Polynomial Functions**

A polynomial is the sum of one or more monomials with real coefficients and nonnegative integer exponents. Polynomials can be divided by other polynomials in order to simplify and find roots of an equation.

This topic addresses the following competencies:

- Competency 209.2.3: Polynomials
  The graduate identifies roots of polynomial functions and uses characteristics of polynomials as an aid to graphing.
- Competency 209.2.7: Algebraic Modeling
  The graduate appropriately defines functions in order to model and analyze change.

**Quadratic Functions**

Read the following sections in *Algebra and Trigonometry* within MyMathLab:

- section 3.1 ("Quadratic Functions")

Complete the following MyMathLab exercises:
• section 3.1
Polynomial Functions and Their Graphs

Read the following sections in *Algebra and Trigonometry* within MyMathLab:

• section 3.2 ("Polynomial Functions and Their Graphs")

Complete the following MyMathLab exercises:

• section 3.2

As you discovered while graphing polynomials, the tail behavior of a polynomial is an important and potentially distinguishing characteristic of a polynomial graph. Focus your energies on describing the tail (or end) behavior of polynomials.

Dividing Polynomials

Read the following sections in *Algebra and Trigonometry* within MyMathLab:

• section 3.3 ("Dividing Polynomials; Remainder and Factor Theorems")

Complete the following MyMathLab exercises:

• section 3.3

Synthetic division of polynomials can be used to find roots of polynomials. How does synthetic division work? How is synthetic division related to factoring? Why might synthetic division be useful for finding roots of polynomials and when graphing polynomials?

Zeros of Polynomial Functions

Read the following sections in *Algebra and Trigonometry* within MyMathLab:

• section 3.4 ("Zeros of Polynomial Functions")

Complete the following MyMathLab exercises:

• section 3.4

Find the zeros of a polynomial, perhaps by using the Rational Root Theorem, synthetic division, and/or factoring. What are the different algebraic methods you can use to find the zeros of a polynomial?

Rational Functions

A rational function is a division of two polynomial functions in the form of a ratio. The domain of a rational function is all real values except those values that make the denominator zero.

This topic addresses the following competencies:
Competency 209.2.3: Polynomials
The graduate identifies roots of polynomial functions and uses characteristics of polynomials as an aid to graphing.

Competency 209.2.7: Algebraic Modeling
The graduate appropriately defines functions in order to model and analyze change.

Rational Functions and Their Graphs

Read the following sections in *Algebra and Trigonometry* within [MyMathLab](https://www.mymathlab.com):

- section 3.5 ("Rational Functions and their Graphs")

Complete the following MyMathLab exercises:

- section 3.5

Modeling

Read the following sections in *Algebra and Trigonometry* within [MyMathLab](https://www.mymathlab.com):

- section 3.7 ("Modeling Using Variation")

Complete the following MyMathLab exercises:

- section 3.7

Exponential and Logarithmic Functions

Exponential functions grow or decay quickly because the rate of change depends on the previous amount. For example, if a population doubles and doubles and doubles it will grow quickly. A common example of exponential growth is the human population. In this subject you will study exponential functions and its inverse, logarithmic functions.

Exponential and Logarithmic Functions

An exponential function is a function that has a variable as an exponent. Exponential functions have graphs that are continuous curves and approach but never cross a horizontal asymptote. In this topic, you will examine exponential calculations and graphs. The logarithmic function is defined as the inverse of the exponential function.

This topic addresses the following competencies:

- Competency 209.2.5: Functional Analysis
  The graduate explores, analyzes, and represents patterns, relations, and functions, including absolute value, radical, logarithmic, exponential, polynomial, and rational functions and their graphs.

- Competency 209.2.7: Algebraic Modeling
  The graduate appropriately defines functions in order to model and analyze change.

Exponential Functions
Read the following sections in *Algebra and Trigonometry* within MyMathLab:

- section 4.1 ("Exponential Functions")

Complete the following MyMathLab exercises:

- section 4.1

In your study notebook, explain why exponential functions are not allowed to have negative bases. Also, explain the importance of the number $e$. Describe the graph of an exponential functions.

**Logarithmic Functions**

Read the following sections in *Algebra and Trigonometry* within MyMathLab:

- section 4.2 ("Logarithmic Functions")

Complete the following MyMathLab exercises:

- section 4.2

In your study notebook, list the characteristics of the graphs of logarithmic functions.

**Exponential Growth and Decay**

Read the following sections in *Algebra and Trigonometry* within MyMathLab:

- section 4.5 ("Exponential Growth and Decay; Modeling Data")

Complete the following MyMathLab exercises:

- section 4.5

In your study notebook, describe three real-world uses for exponential functions in understanding rate of growth or decay. How would you know if a given exponential function is describing growth or decay?

**Systems of Equations and Inequalities**

A system of equations or inequalities has more than one equation as part of the problem. This adds complexity to the problem. This section extends the fundamental topics previously learned and works towards solving sets of equations and inequalities rather than a single equation or inequality.

**Systems of Equations and Inequalities**

A system of two linear equations can have no solutions, one solution, or an infinite number of solutions depending on whether the two lines that represent the equations intersect, overlap or are parallel. As you work through this topic consider how the graphs and solutions to the
systems of equations relate.

This topic addresses the following competencies:

- Competency 209.2.2: Equations and Inequalities
  The graduate solves and graphs linear and quadratic equations and inequalities.

**Systems of Linear Equations**

Read the following sections in *Algebra and Trigonometry* within MyMathLab:

- section 8.1 ("Systems of Linear Equations in Two Variables")

Complete the following MyMathLab exercises:

- section 8.1

In your study notebook, describe all three different methods available to solve a system of linear equations:

- graphing
- substitution
- elimination

**Systems of Nonlinear Equations**

Read the following sections in *Algebra and Trigonometry* within MyMathLab:

- section 8.4 ("Systems of Nonlinear Equations in Two Variables")

Complete the following MyMathLab exercises:

- section 8.4

**Systems of Inequalities**

Read the following sections in *Algebra and Trigonometry* within MyMathLab:

- section 8.5 ("Systems of Inequalities")

Complete the following MyMathLab exercises:

- section 8.5

**Conic Sections**

The study of conic sections includes parabolas, hyperbolas, circles, and ellipses. These common shapes result from slicing a cone with a plane. One common application for conic sections is the movement of objects in the universe since they tend to follow parabolic, circular
and elliptical patterns.

**Conic Sections**

In this topic you will study common conic sections including circles, ellipses, parabolas, and hyperbolas. For each conic section you will analyze its definition and learn how to convert between its equation and graph.

This topic addresses the following competencies:

- Competency 209.2.4: Conic Sections
  The graduate identifies and analyzes important characteristics of conic sections and graphs them.

**The Circle**

Read the following sections in *Algebra and Trigonometry* within MyMathLab:

- section 2.8 ("Distance and Midpoint Formulas; Circles")

Complete the following MyMathLab exercises:

- section 2.8

**The Ellipse**

Read the following sections in *Algebra and Trigonometry* within MyMathLab:

- section 10.1 ("The Ellipse")

Complete the following MyMathLab exercises:

- section 10.1

**The Hyperbola**

Read the following sections in *Algebra and Trigonometry* within MyMathLab:

- section 10.2 ("The Hyperbola")

Complete the following MyMathLab exercises:

- section 10.2

**The Parabola**

Read the following sections in *Algebra and Trigonometry* within MyMathLab:

- section 10.3 ("The Parabola")

Complete the following MyMathLab exercises:
section 10.3

Final Steps

Congratulations on completing the activities in this course! This course has prepared you to complete the assessments associated with this course. If you have not already been directed to complete the assessments, schedule and complete your assessments now.

Assessment Information

Complete the following skills check in MyMathLab:

- College Alg Skills Check: Numbers & Operations
- College Alg Skills Check: Equations & Inequalities
- College Alg Skills Check: Polynomials
- College Alg Skills Check: Functional Analysis
- College Alg Skills Check: Conic Sections

Refer to “Using Skills Checks” for information about how to appropriately use this learning resource tool.

The WGU Library

The WGU Library is available online to WGU students 24 hours a day.

For more information about using the WGU Library, view the following videos on The WGU Channel:

- WGU: Accessing the Library
- WGU Library: Finding Articles, Books, & E-Reserves

Center for Writing Excellence: The WGU Writing Center

If you need help with any part of the writing or revision process, contact the Center for Writing Excellence (CWE). Whatever your needs—writing anxiety, grammar, general college writing concerns, or even ESL language-related writing issues—the CWE is available to help you. The CWE offers personalized individual sessions and weekly group webinars. For an appointment, please e-mail writingcenter@wgu.edu.

Feedback

WGU values your input! If you have comments, concerns, or suggestions for improvement of this course, please submit your feedback using the following form:

- Course Feedback

Accessibility Policy

Western Governors University recognizes and fulfills its obligations under the Americans with Disabilities Act of 1990 (ADA), the Rehabilitation Act of 1973 and similar state laws. Western
Governors University is committed to provide reasonable accommodation(s) to qualified disabled learners in University programs and activities as is required by applicable law(s). The Office of Student Accessibility Services serves as the principal point of contact for students seeking accommodations and can be contacted at ADASupport@wgu.edu. Further information on WGU’s Accessibility policy and process can be viewed in the student handbook at the following link:

- [Policies and Procedures for Students with Disabilities](#)