# College Algebra

## Course Description

This course teaches the fundamentals of college-level algebra, with a primary focus on functions. We will discover early on what a function is and how this relates to equations. Students will be able to identify key concepts visually by being presented with a graph or algebraically, given the equation of the function. We will learn several ways to approach the same question, using different theorems and formulas such as the quadratic formula, completing the square, or the remainder theorem and the factor theorem to find the zeros of a function. The course ends with a basic introduction to sequences, series and combinatorics.

## Required Text

The text that accompanies this course is *College Algebra*. (Beecher, 2015)

## Prerequisites

There are no prerequisites for this course.

## Learning Outcomes

* Solve linear equations and inequalities, absolute value equations and inequalities, polynomial equations and inequalities, rational equations and inequalities, and systems of linear and nonlinear inequalities.
* Solve systems of equations in two and three variables using substitution, elimination, and matrices (Gaussian elimination, Gauss-Jordan elimination, and Cramer’s Rule)
* Find the domain and range of a function. Determine where a function is increasing or decreasing. Identify maximum and minimum values of functions. Find the sum, difference, product and quotients of functions.
* Determine the symmetry of functions. Perform transformations of functions.
* Identify different types of functions (linear, quadratic, polynomial, rational, exponential, and logarithmic).
* Determine the asymptotes, zeros, x and y intercepts of functions.
* Divide polynomials. Utilize the leading term test, the remainder theorem and the factor theorem.
* Convert between logarithmic and exponential equations.
* Decompose rational expressions into partial fractions.
* Graph equations of circles, ellipses and hyperbolas.
* Determine the general term and sum of an arithmetic and geometric sequence and series. Denote a sum using sigma notation.
* Utilize the binomial theorem to expand a power of a binomial.
* Determine the number of combinations or permutations of n objects taken k at a time. Also determine the theoretical probability of a situation.

## Course Topics

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| Category/Topics | Learning Content |
| Graphing, Equations, and Functions | Introduces graphing, equations, and functions. Defines the distance and midpoint formulas and the standard equation of a circle. Explains how to determine if a correspondence, relation, or a graph is a function. Defines domain and range of a function. |
| Linear Functions, Slope, and Equations of Lines | Explains how to find the slope and intercepts of a line, and how to graph a linear equation. Demonstrates how to write the equation of a line in slope-intercept form and using the point-slope equation of a line. Describes how to compare two lines.  |
| Linear Models and Linear Inequalities | Teaches the use of linear models to model a set of data. Provides applied problems that are solved using linear models. Defines “zeros” of functions and explains how to find the zeros of linear functions. Teaches how to solve linear inequalities and compound inequalities, and how to graph the solution sets. |
| Analyzing Functions | Explains how to determine increasing, decreasing, and constant intervals in functions. Defines relative maxima and minima. Provides examples of creating a function to model an application. Introduces piecewise functions and how to graph them. Defines the greatest integer function.  |
| Algebra and Composition of Functions | Teaches how to add, subtract, multiply and divide two functions, and how to determine the resulting domain. Defines the difference quotient. Explains how to find the composition of two functions and the resulting domain, and how to decompose a function. |
| Symmetry, Transformations, and Variation | Explains how to analyze the symmetry of a function or graph, and how to determine if a graph is even or odd. Teaches the use of transformations to graph a function. Defines direct, inverse, and combined variation. Provides applied problems that are solved by creating an equation of variation.  |
| Complex Numbers | Introduces ‘i’. Teaches how to find the sum, difference, product, and quotient of complex numbers. Explains how to simply powers of ‘i’ and the use of conjugates of complex numbers. |
| Quadratic Equations and Quadratic Functions | Explains how to find the zeros of quadratic functions, and how to solve quadratic equations by using the principle of zero products, the principle of square roots, the quadratic formula, and by completing the square. Teaches how to determine the vertex, axis of symmetry, maximum or minimum of a quadratic function, and then how to graph the function. Shows how the maximum or minimum of a quadratic function is used to solve applied problems. |
| Rational Equations, Radical Equations, and Absolute Value | Teaches how to solve rational equations and radical equations. Explains how to solve absolute value equations and inequalities and how to graph the solution set. |
| Polynomial Functions | Defines the leading term test for polynomial functions. Demonstrates how to find the zeros and multiplicities of polynomial functions, and how to graph them. Defines the Intermediate Value Theorem. Teaches long and synthetic division for polynomials. Defines the Factor Theorem and Remainder Theorem. |
| Theorems about Zeros of Polynomial Functions | Defines the Fundamental Theorem of Algebra, the Rational Zeros Theorem, and Descartes’ Rule of Signs. Explain how to find a polynomial function given its zeros. |
| Rational Functions, Polynomial Inequalities, and Rational Inequalities | Defines rational functions and asymptotes. Teaches how to solve polynomial inequalities and rational inequalities. |
| Inverse Functions and Exponential Functions | Explains how to find the inverse of a function. Defines a “one-to-one” function and demonstrates how to test if a function is one-to-one. Teaches how to graph exponential functions. |
| Logarithmic Functions | Reviews common and natural logarithms. Explains how to convert between exponential equations and logarithmic equations. Defines the change of base formula. Demonstrates how to graph logarithmic functions. Defines the product rule, power rule, and quotient rule for logarithms. Explains how to simplify expressions involving a logarithm of a base to a power or a base to a logarithmic power. Demonstrates how to solve exponential equations and logarithmic equations. |
| Applications and Models | Teaches functions for modeling exponential growth, exponential decay, and compound interest. Demonstrates how to solve applied problems involving population growth, interest compounded continuously, limited growth, exponential decay, and half-life. |
| Systems of Equations and Systems of Linear Inequalities | Teaches how to solve systems of equations in two variables using graphing or the substitution or elimination method. Provides examples of solving applied problems using systems of equations. Demonstrate how to graph linear inequalities and systems of linear inequalities. |
| Nonlinear Systems of Equations and Inequalities | Explains how to solve nonlinear systems of equations. Provides examples of using nonlinear systems of equations to solve applied problems. Demonstrates how to graph nonlinear systems of inequalities. |
| Sequences and Series | Teaches how to find the terms of a sequence, how to predict the general term, and how to determine the partial sum of a sequence. Explains sigma notation and recursively defined sequences. |

## Study Questions

Study questions are similar to homework assignments for reviewing and supplementing what you have learned in a lesson. You can repeat the questions as preferred, but will need to achieve a score of 80% or higher on the study questions associated with a lesson before that lesson is marked as complete. You will then receive the appropriate proportion of the total number of points available for the study questions based on their overall average score for all study questions in the course.

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## Course Time Limit

This course is self-paced, which means you can complete the course requirements at a pace that is comfortable for you. However, there is an overall time limit of 180 days to complete each course, starting from the date on which you registered. This time limit is indicated on your Courses screen as “Course Period.”

Once the time limit has passed, you will no longer be able to attempt any further activities or assessments. Assuming you have not yet attempted the Final Exam, you can immediately unregister and reregister for the course to start over. Otherwise, you will be required to wait to reregister per our Course Retake Policy.

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## Course Retake Policy

There is a one-week waiting period before this course can be re-taken, starting from the date of the last Final Exam attempt.

To retake the course, first unregister from the course on your Courses screen. If it has been over a week since your last attempt, you will then be able to register for this course again.

Your highest final score for the course will be used for the transcript.

## Exams

There are a total of four exams for this course as described below.

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| --- | --- | --- | --- |
| **Exam** | **Coverage** | **Number of Multiple-Choice Questions** | **Time Limit, Minutes** |
| **First** | Lessons 1-7 | 25 | 60 |
| **Midterm** | Lessons 8-16 with some review of topics from Lessons 1-7 | 50 | 90 |
| **Third** | Lessons 17-26 | 25 | 60 |
| **Final** | Cumulative; everything taught in the course with an emphasis on content from the last half (and particularly the last quarter) of the course | 50 | 90 |

## Grading

To determine your level of mastery for this course, you will earn points by successfully completing the learning and evaluation activities below in sequence.

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| --- | --- |
| Source | Points Available |
| Study Questions | 300 |
| Graded Exam #1 | 100 |
| Midterm Exam | 200 |
| Graded Exam #2 | 100 |
| Final Exam | 300 |

Upon completion of the course and the grading source activities, InstantCert will provide you with a percentage score. The minimum passing score is 700 points, or an overall course grade of 70%.

**Important! Only a passing score on a course marked 100% complete (including the proctored final exam) is eligible for college credit.**

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## Proctoring of the Final Exam

A proctor is a person who monitors the work of another person who is taking an examination. Online proctoring services allow you to take the working remotely and in the same way as if you were sitting in an exam room. Proctoring ensures that the test you take complies with current college level examination policies.

Proctoring is used only for the final exam. It is offered through the online proctoring service RPNow at the Software Secure web site. You will pay a separate fee to RPNow for each final exam attempt.

RPNow requires that students download and install proprietary software. They will need to use a PC or a Mac with a webcam. Students can review the full system requirements for RPNow at:

<http://clientportal.softwaresecure.com/support/index.php?/Knowledgebase/Article/View/252/0/system-requirements-remote-proctor-now>

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## Exam Retake Policy

Both graded exams, the midterm and the final exam can be retaken ONCE. There is a 3-day waiting period before you will be allowed to retake an exam. If you retake an exam, the higher result of your two attempts will be used to calculate your final score.

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## Academic Integrity

You are required to comply with the InstantCert full Student Code of Conduct, which specifically prohibits cheating or any other academically dishonest behavior. Violation of any part of the Student Code of Conduct can result in a grade reduction or even suspension from the course.

## Software Requirements

The operating system, browser, internet access and speed are provided below for use with courses from the InstantCert web site.

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| --- | --- |
| **Operating Systems** | * Windows XP and above
* Mac OS X
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| **Browsers** | * The latest version of Chrome, Firefox of Safari
* IE9 or higher
 |
| **Internet and Speed** | Broadband Internet; 1Mbps or higher |

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## Accessibility and Disability Accommodations

InstantCert strives to make online education accessible to people everywhere in the following ways:

* All course content is available online, accessible from anywhere through an Internet connection.
* All video lessons include a transcript for use by those who are hearing impaired and/or by students that wish to have written copies of the lessons.
* All video lessons have close captioning.
* Lesson pages can be navigated by screen readers.
* Videos may be replayed an unlimited amount of times. Video speed can be increased or slowed.
* Lesson transcripts and quizzes can be printed for offline use.
* The proctoring software RPNow works with screen readers.