

# MATH 010: COLLEGE ALGEBRA

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**Originator**

ljordan

**Co-Contributor(s)****Name(s)**

Jordan, Leif

**Justification / Rationale**

Add Online Modality Add OER Textbook Align with C-ID Math 151

**Effective Term**

Fall 2022

**Credit Status**

Credit - Degree Applicable

**Subject**

MATH - Mathematics

**Course Number**

010

**Full Course Title**

College Algebra

**Short Title**

COLLEGE ALGEBRA

**Discipline****Disciplines List**

Mathematics

**Modality**

Face-to-Face

100% Online

Hybrid

**Catalog Description**

This is a function oriented course that includes an examination of the general concept of a function and function notation, as well as an in depth investigation of polynomial, rational, exponential, and logarithmic functions, particularly their equations, graphs, and behavior. Other topics include the binomial theorem, conic sections, and matrices as they apply to systems of linear equations. (C-ID MATH 150)

Note: All students now can enroll in this transfer-level course without completing posted prerequisites. Please refer to AB 705 (under How do I enroll in courses at COD?) or see a Counselor.

**Schedule Description**

This is a function oriented course including the concept of a function and function notation.

Prerequisite: MATH 040 or MATH 049

Advisory: ENG 061

IGETC: 2A\*

**Lecture Units**

3

**Lecture Semester Hours**

54

**Lab Units**

1

**Lab Semester Hours**

54

**In-class Hours**

108

**Out-of-class Hours**

108

**Total Course Units**

4

**Total Semester Hours**

216

**Prerequisite Course(s)**

MATH 040 or MATH 049

Advisory: ENG 061

**Required Text and Other Instructional Materials****Resource Type**

Book

**Author**

Stewart, James;, Redlin, Lothar; Watson, Saleem

**Title**

College Algebra

**Edition**

7th

**Publisher**

Cengage

**Year**

2016

**College Level**

Yes

**ISBN #**

9781305115545

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**Resource Type**

Web/Other

**Description**Other Instructional Materials:  
Scientific calculator

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**Resource Type**

Book

**Open Educational Resource**

Yes

**Author**

Jay Abramson

**Title**

College Algebra

**Edition**

1st

**Publisher**

OpenStax

**Year**

2018

**College Level**

Yes

**ISBN #**

978-1-938168-38-3

**Class Size Maximum**

30

**Entrance Skills**

Demonstrate an understanding that the key characteristic of a linear model is its constant rate of change.

**Requisite Course Objectives**

MATH 040-Comprehend that the key characteristic of a linear model is its constant rate of change.

MATH 049-Comprehend that the key characteristic of a linear model is its constant rate of change. Recognize when a table, graph or equation is linear.

**Entrance Skills**

Interpret slope as a rate of change.

**Requisite Course Objectives**

MATH 040-Interpret slope as a rate of change.

MATH 049-Interpret slope as a rate of change, in preparation for generalizing the rate of change to the derivative in the Calculus course.

**Entrance Skills**

Recognize when a table, graph, or equation is linear.

**Requisite Course Objectives**

MATH 040-Recognize when a table, graph, or equation is linear.

MATH 049-Comprehend that the key characteristic of a linear model is its constant rate of change. Recognize when a table, graph or equation is linear.

**Entrance Skills**

Create a linear model in the form of a table, graph, or equation.

**Requisite Course Objectives**

MATH 040-Create a linear model in the form of a table, graph, or equation.

MATH 049-Create and comprehend a linear model in the form of a table, graph, or equation from a verbal description, using the rule of 4.

**Entrance Skills**

Find the equation of a line and apply it to solve problems with a constant rate of change.

**Requisite Course Objectives**

MATH 040-Find the equation of a line and apply it to solve problems with a constant of change.

MATH 049-Find the equation of a line and apply it to solve problems with a constant rate of change.

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**Entrance Skills**

Solve  $2 \times 2$  and  $3 \times 3$  systems of linear equations.

**Requisite Course Objectives**

MATH 040-Solve  $2 \times 2$  and  $3 \times 3$  systems of linear equations.

MATH 049-Solve  $2 \times 2$  and  $3 \times 3$  systems of linear equations apply this to model circles, parabolas lines from given data, as a lead into generalizing to least square methods in the Calculus sequence.

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**Entrance Skills**

Graph systems of linear inequalities in two dimensions.

**Requisite Course Objectives**

MATH 040-Graph systems of linear inequalities in two dimensions.

MATH 049-Graph systems of linear inequalities in two dimensions. Introduction to non-linear inequalities.

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**Entrance Skills**

Graph and find the equation of a circle.

**Requisite Course Objectives**

MATH 040-Graph and find the equation of a circle.

MATH 049-Graph and find the equation of a circle. Graph the circle to discuss the domain range of the explicit functions defined from the implicit circular relation, to prepare for applications of circles in Trigonometry.

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**Entrance Skills**

Solve quadratic equations by factoring, completing the square, taking square roots or the quadratic formula.

**Requisite Course Objectives**

MATH 040-Solve quadratic equations by factoring, completing the square, taking square roots or the quadratic formula.

MATH 049-Solve quadratic equations by factoring, completing the square, taking square roots and the quadratic formula.

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**Entrance Skills**

Solve quadratic inequalities.

**Requisite Course Objectives**

MATH 040-Solve quadratic inequalities.

MATH 049-Solve quadratic inequalities. Also solve inequalities of higher degree polynomials graphically in preparation for the the first and second derivative tests in Calculus. If time permits, solve rational inequalities.

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**Entrance Skills**

Recognize when a table, graph, or equation is quadratic.

**Requisite Course Objectives**

MATH 040-Recognize when a table, graph, or equation is quadratic.

MATH 049-Recognize when a table, graph, or equation is quadratic.

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**Entrance Skills**

Create a quadratic model with a table, graph, or equation and solve maximum and minimum problems.

**Requisite Course Objectives**

MATH 040-Create a quadratic model with a table, graph, or equation and solve maximum and minimum problems.

MATH 049-Create a quadratic model with a table, graph, or equation and solve maximum and minimum problems. Start to develop the terminology and notation associated with the Extreme Value Theorem in Calculus.

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**Entrance Skills**

Graph a parabola by finding the vertex, intercepts, and using properties of symmetry.

**Requisite Course Objectives**

MATH 040-Graph a parabola by finding the vertex, intercepts, and other symmetric points.

MATH 049-Graph a parabola by finding the vertex, intercepts, and other symmetric points. Graph a circle by finding the "extreme points" and center.

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**Entrance Skills**

Understand and manipulate rational exponents and Nth roots.

**Requisite Course Objectives**

MATH 040-Comprehend and manipulate rational exponents and Nth roots.

MATH 049-Comprehend and manipulate rational exponents and Nth roots, and solve radical equations.

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**Entrance Skills**

Solve equations involving square roots.

**Requisite Course Objectives**

MATH 040-Solve root equations.

MATH 049-Comprehend and manipulate rational exponents and Nth roots, and solve radical equations.

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**Entrance Skills**

Demonstrate an understanding of the definition of a function including function notation and terminology (domain and range).

**Requisite Course Objectives**

MATH 040-Apply the definition of a function including function notation and terminology (domain and range).

MATH 049-Apply the definition of a function including function notation and terminology (domain and range), especially as function notation relates to a graph. Develop the ability to read a graph and precisely describe how the output variable changes wrt (with respect to) the output variable, using function notation and inequality notation.

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**Entrance Skills**

Demonstrate an understanding that the key characteristic of an exponential function is its constant growth (decay) factor.

**Requisite Course Objectives**

MATH 040-Comprehend that the key characteristic of an exponential function is its constant growth (decay) factor.

MATH 049-Comprehend that the key characteristic of an exponential function is its constant growth (decay) factor. Recognize when a table, graph or function is exponential.

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**Entrance Skills**

Recognize when a table, graph, or equation is exponential and when a word problem can be modeled with an exponential function.

**Requisite Course Objectives**

MATH 040-Recognize when a table, graph, or equation is exponential and when a word problem can be modeled with an exponential function.

MATH 049-Recognize when a table, graph, or equation is exponential and when a word problem can be modeled with an exponential function. Develop the language associated with an exponential function such as: growth or decay factor; percent increase or decrease.

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**Entrance Skills**

ADVISORY SKILLS:

Demonstrate critical thinking skills when reading, composing and participating in class discussions.

**Requisite Course Objectives**

ENG 061-Demonstrate the ability to think critically and express ideas using various patterns of development.

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**Entrance Skills**

Develop, organize and express complex ideas in both expository and research papers.

**Requisite Course Objectives**

ENG 061-Use theses to organize paragraphs into coherent analyses.

ENG 061-Demonstrate the ability to use research skills including library resources such as books, periodicals, electronic databases and online resources such as the internet.

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**Entrance Skills**

Define, analyze, evaluate, explain, classify, compare and contrast ideas in written form.

**Requisite Course Objectives**

ENG 061-Use theses to organize paragraphs into coherent analyses.

ENG 061-Recognize features of style such as purpose, audience and tone integrate these elements into academic and professional writing.

ENG 061-Demonstrate the ability to read and respond in writing beyond the literal interpretation of the text.

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**Entrance Skills**

Demonstrate comprehension of rational numbers and their representation as decimals and fractions. Demonstrate the ability to judge relative sizes of rational numbers and the ability to add, subtract, multiply, and divide rational numbers without a calculator.

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**Entrance Skills**

Demonstrate a high level of proficiency in the operations of addition, subtraction, multiplication, and division as well as computing exponents and roots.

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**Course Content**

1. Functions, including function-notation, domain and range, piecewise defined functions, and rates of change.
2. The algebra of functions, including composition of functions, symmetry and inverses.
3. Transformations of quadratic, absolute value, radical, rational, exponential and logarithmic functions.
4. Polynomial functions: roots (zeroes); factoring; polynomial division and the remainder and factor theorems; roots and complex numbers; the graphs of and behavior of polynomial functions; polynomial functions as models.
5. Rational functions: roots (zeroes); vertical asymptotes; horizontal asymptotes; oblique asymptotes; the graph of and behavior of rational functions; rational functions as models.
6. Inverse functions, their significance and the computation of an inverse function.
7. Exponential and logarithmic functions; the graphs and behavior of exponential and logarithmic functions. Solving exponential and logarithmic equations. Applications; including exponential growth and decay.
8. Geometric definitions and algebraic formulas for parabolas, circles, ellipses, and hyperbolas. Graphing conic sections; their behavior and characteristic properties; their use in solving application problems.
9. Solve linear, polynomial, rational, radical and absolute value equations.
10. Solve linear, nonlinear and absolute value inequalities. Represent solution sets by graphing, set notation and interval notation.
11. Find the general term in a sequence. Calculate finite and infinite sums by repeated summation and by using formulas.
12. **Optional:** Matrices and the use of matrices to solve systems of linear equations, including Gauss-Jordan elimination and Cramer's Rule.

**Lab Content**

1. Analyze and investigate the properties of functions; Synthesize results from the graphs and/or equations of functions;
2. Recognize the behavior of polynomial, rational, exponential, and logarithmic functions by applying transformations to the graphs of functions; graph by hand or by using software.
3. Recognize the relationship between functions and their inverses graphically and algebraically; graph by hand, or by using software.
4. Solve and apply rational, linear, polynomial, radical, absolute value, exponential, and logarithmic equations and solve linear, nonlinear, and absolute value inequalities; discuss various solution methods.
5. Analyze conics by definition both algebraically and geometrically; Modeling applications in STEM fields; complete projects or group activities.

6. Apply functions and other algebraic techniques to model applications in a variety of disciplines, including STEM fields, business and economics;
7. Exploration of applications that involve combining and expanding upon concepts that were demonstrated in lecture.
8. Demonstration of mathematical reasoning in either written work or oral presentations.

### Course Objectives

	Objectives
Objective 1	Analyze and investigate properties of functions; Represent a function graphically, numerically, and analytically and synthesize information from these representations.
Objective 2	Demonstrate an understanding of function notation and operations including inverses and compositions of functions; Recognize the relationship between functions and their inverses graphically and algebraically
Objective 3	Compute average rates of change and interpret as slope of a secant line.
Objective 4	Recognize, graph and solve equations involving polynomial, rational, exponential, root, and logarithmic functions; Solve linear, nonlinear and absolute value inequalities.
Objective 5	Recognize the behavior of polynomial, rational, exponential, and logarithmic functions; Use transformations to graph polynomial, rational, exponential, and logarithmic functions.
Objective 6	Recognize and apply the appropriate function to solve problems involving tables, graphs, equations or words.
Objective 7	Create a system of linear equations modeling an application problem in STEM fields, Business and Economics.
Objective 8	Recognize and graph the equations of parabolas, circles, ellipses, and hyperbolas.
Objective 9	Recognize the behavior and characteristic properties of parabolas, circles, ellipses, and hyperbolas; Describe these characteristic properties in terms of how they are expressed in the standard form of the equation of a conic.
Objective 10	Use linear, exponential and logarithmic equations and equations of conics to model application problems in STEM fields, Business and Economics.
Objective 11	Apply studied principles and skills to new situations in addition to situations that mirror those on the homework and those shown in class
Objective 12	Use formulas to find sums of finite and infinite series.
Objective 13	Apply techniques for finding zeros of polynomials and roots of equations including , factoring, polynomial division, the remainder theorem, and factor theorem
Objective 14	Solve rational, linear, polynomial, radical, absolute value, exponential, and logarithmic equations and solve linear, nonlinear, and absolute value inequalities. Including applications.

### Student Learning Outcomes

	Upon satisfactory completion of this course, students will be able to:
Outcome 1	Apply algebraic and geometric principles to contrast different families of functions.
Outcome 2	Demonstrate problem solving skills in application problems, with an emphasis on the concept of function.
Outcome 3	Create, analyze, and interpret graphs of functions.
Outcome 4	Explain the role of deductive reasoning in mathematics and determine appropriate usage of deductive reasoning and mathematics in human life and culture.

### Methods of Instruction

Method	Please provide a description or examples of how each instructional method will be used in this course.
Lecture	Lecture will be used for introduction and explanation of course topics.
Discussion	Discussion will be used to review, analyze, and evaluate various methods of solution.
Laboratory	Lab will be used, in groups or individually, for student exploration of the topics of the course.
Activity	Activities in the lab portion of the class will include using various tools for developing problem solving skills.

**Methods of Evaluation**

Method	Please provide a description or examples of how each evaluation method will be used in this course.	Type of Assignment
Written homework	Students will be evaluated by homework amounting to at least six hours per week.	Out of Class Only
Tests/Quizzes/Examinations	Students will be evaluated by examinations involving problems that require the application of studied principles and skills to new situations as well as problems that mimic those done on homework and in class.	In Class Only
Mid-term and final evaluations	Students will be evaluated by a comprehensive two-hour final exam.	In Class Only
Computational/problem-solving evaluations	Students will be evaluated by completing challenging problem sets requiring careful reasoning and application of a variety of course topics.	In and Out of Class
Laboratory projects	Students will apply course topics to solve significant problems emphasizing applications in business, science, and mathematics.	In Class Only
Student participation/contribution	Students will be evaluated by their participation in lab activities and may be required to turn in written summaries of these activities.	In Class Only

**Assignments**
**Other In-class Assignments**

1. Read textbooks and supplementary assignments.
2. Attend classroom lectures and take notes.
3. Participate in classroom discussions to review, analyze, diagnose and evaluate various methods of solution used in homework.
4. Complete examinations involving problems that apply studied principles to new situations.

**Other Out-of-class Assignments**

1. Read textbooks and supplementary assignments.
2. Complete assigned homework including problem solving exercises to improve skills and mathematical understanding.

**Grade Methods**

Letter Grade Only

**Distance Education Checklist**

Include the percentage of online and on-campus instruction you anticipate.

**Online %**

100

**On-campus %**

0

**What will you be doing in the face-to-face sections of your course that necessitates a hybrid delivery vs a fully online delivery?**

Although the course can be offered entirely online, it may also be offered hybrid to take advantage of collaboration activities that are more suited to in-person interaction.

Examinations can be given in a controlled location.

**Lab Courses**

**How will the lab component of your course be differentiated from the lecture component of the course?**

Lab assignments are designed to engage the student in active learning. Lab assignments help to improve the students skills by synthesizing the material that was presented in lecture.



**From the COR list, what activities are specified as lab, and how will those be monitored by the instructor?**

The following lab activities are discussions and assignments that involve solving problems or exploring concepts with other students under the guidance of the professor or instructional support assistant.

1. Analyze and investigate the properties of functions; Synthesize results from the graphs and/or equations of functions; Recognize the behavior of polynomial, rational, exponential, and logarithmic functions by applying transformations to the graphs of functions; graph by hand or by using software.
2. Recognize the relationship between functions and their inverses graphically and algebraically; graph by hand, or by using software. Solve and apply rational, linear, polynomial, radical, absolute value, exponential, and logarithmic equations and solve linear, nonlinear, and absolute value inequalities; discuss various solution methods.
3. Analyze conics by definition both algebraically and geometrically; Modeling applications in STEM fields; complete projects or group activities.
4. Apply functions and other algebraic techniques to model applications in a variety of disciplines, including STEM fields, business and economics;
5. Exploration of applications that involve combining and expanding upon concepts that were demonstrated in lecture.
6. Demonstration of mathematical reasoning in either written work or oral presentations.

Discussions and other assignments that are completed in Canvas are monitored and evaluated by the professor. Assignments that do not take place in Canvas are evaluated by the professor based on write-ups (which may include summaries and feedback from the participants). Anonymous and non-anonymous feedback opportunities will be available to students to allow the professor further monitor effectiveness and appropriateness of activities that take place somewhere other than on the course LMS.

**How will you assess the online delivery of lab activities?**

Assessments of the lab activities will be submitted using the course LMS for evaluation and feedback.

**Instructional Materials and Resources****If you use any other technologies in addition to the college LMS, what other technologies will you use and how are you ensuring student data security?**

Depending on the textbook used, the professor may choose to use the free OER MyOpenMath, or Pearson MyLab and Mastering, Cengage WebAssign. All of these are considered to be safe for use in education for both faculty and students. All can also be integrated with the college LMS (Canvas), which decreases the amount of times students will need to sign-in-and-out of accounts and open them up to data breaches.

**If used, explain how specific materials and resources outside the LMS will be used to enhance student learning.**

Professors who choose to use MyOpenMath, Pearson MyLab and Mastering, Cengage WebAssign, or do so in order to assign instructor designed custom problems, problems designed by a colleague at COD or another institution, or pre-made problems that have been vetted by the instructor that are more sophisticated than those that can be created in Canvas while still receiving instantaneous feedback.

**Effective Student/Faculty Contact****Which of the following methods of regular, timely, and effective student/faculty contact will be used in this course?****Within Course Management System:**

Discussion forums with substantive instructor participation  
Online quizzes and examinations  
Private messages  
Regular virtual office hours  
Timely feedback and return of student work as specified in the syllabus  
Weekly announcements

**External to Course Management System:**

Direct e-mail  
Posted audio/video (including YouTube, 3cm mediasolutions, etc.)  
Synchronous audio/video  
Telephone contact/voicemail

**For hybrid courses:**

Orientation, study, and/or review sessions  
Scheduled Face-to-Face group or individual meetings

**Briefly discuss how the selected strategies above will be used to maintain Regular Effective Contact in the course.**

Faculty will regularly contact students individually and as a group through Canvas messages and/or COD email. Students will also receive regular announcements with information about the course, COD as a whole, or other relevant information.

In discussions and through other lab assignments, students will communicate with each other and their professor regularly and frequently.

**If interacting with students outside the LMS, explain how additional interactions with students outside the LMS will enhance student learning.**

Students may prefer to contact their professor via email or on the phone, which allows for an improved experience for those who communicate better in those contexts. The professor may direct students to access free supplemental resources as well.

## Other Information

### Comparable Transfer Course Information

#### University System

CSU

#### Campus

CSU San Bernardino

#### Course Number

Math 110

#### Course Title

College Algebra

#### Catalog Year

2020

#### Rationale

This course covers identical material and completes the quantitative reasoning requirement for the bachelors degree.

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#### COD GE

C4.B - Language and Rationality - Communication and Analytical Thinking

#### CSU GE

B4 - Mathematics

#### IGETC GE

2A - Mathematical Concepts & Quantitative Reasoning

### MIS Course Data

#### CIP Code

27.0101 - Mathematics, General.

#### TOP Code

170100 - Mathematics, General

#### SAM Code

E - Non-Occupational

#### Basic Skills Status

Not Basic Skills

#### Prior College Level

Not applicable

#### Cooperative Work Experience

Not a Coop Course

#### Course Classification Status

Credit Course

**Approved Special Class**

Not special class

**Noncredit Category**

Not Applicable, Credit Course

**Funding Agency Category**

Not Applicable

**Program Status**

Program Applicable

**Transfer Status**

Transfer CSU, limited UC

**C-ID**

MATH 150

**Allow Audit**

No

**Repeatability**

No

**Materials Fee**

No

**Additional Fees?**

No

**Approvals****Curriculum Committee Approval Date**

04/05/2022

**Academic Senate Approval Date**

04/28/2022

**Board of Trustees Approval Date**

05/20/2022

**Chancellor's Office Approval Date**

09/27/2010

**Course Control Number**

CCC000255006

**Programs referencing this course**

Liberal Arts: Business and Technology AA Degree (<http://catalog.collegeofthedesert.eduundefined/?key=27>)

Liberal Arts: Math and Science AA Degree (<http://catalog.collegeofthedesert.eduundefined/?key=29>)

Business Administration 2.0 AS-T Degree (<http://catalog.collegeofthedesert.eduundefined/?key=355>)