MATH-105: COLLEGE ALGEBRA

Viewing: MATH-105 : College Algebra

Also listed as: MATH-105H

Campus

San Jacinto Campus
Menifee Valley Campus

Catalog Entry

Discipline

MATH - Mathematics

Course Number

105

Course Title

College Algebra

Short Title

College Algebra

Credit Status (CB 04)

D - Credit - Degree applicable

Units

Lecture Units

4.00

Total Units

4.00

Hours

Lecture Contact Hours

4.00

Total Contact Hours

64.00 - 72.00

Distance Education

Yes

Distance Education

Distance Education Type

Both Fully Online and Hybrid Online

Does the DE also apply to the Honors section?

No

Fully Online Delivery Requirements:
a. Students must be notified via the college schedule of classes and the syllabus for the class if proctored tests are required for this course
b. Any planned face-to-face meetings, such as an orientation or study session, must be optional
c. The MSJC curriculum committee requires the use of accessible, asynchronous discussion as a component of every fully online course

Regular effective contact

It should be the same as on course revisions: Orientation at start of course - Students will be oriented to the online and face-to-face portions of the course on the first day of class. Announcements/Bulletin Boards - Announcements using the course management system will be posted at least weekly to keep students current on course events, due dates, materials, etc. Chat Rooms - Chat rooms on course questions, various genres, and student reading groups will be utilized to give students a place to complete group work and work on group projects. Discussion Boards - Communication via discussion boards will be initiated and maintained, with timely feedback provided. At least two discussion forums a week should be utilized for students to have a forum for discussion about the content of the course. Teleconferencing - Teleconferencing between students and the instructor to discuss assigned essays and projects will take place via telephone, CCCconfer, or email. Office hours - Instructors will hold regular office hours online using discussion forums, instant messaging, telephone, etc. Scheduled Face-to-Face Meetings - Hybrid courses will meet at regularly scheduled times (at least 5 times per semester).

Honors / Non-honors

MATH-105H

C-ID (Admin Only)

CB 00

CCC000610099

Course Title

Honors College Algebra

Approved CSU Area

B4

Approved Second CSU Area

Approved Third CSU Area

Approved IGETC Area

2A

Approved Second IGETC Area

Approved Third IGETC Area

C-ID (Admin Only)

C-ID MATH 151

Catalog Description

This course covers graphing of polynomial, rational and transcendental functions and conic sections, solving of polynomial, rational, exponential and logarithmic equations and related applications, solving of systems of linear equations utilizing determinants, function theory including notation, combination and composition as well as existence and formulation of inverses, sequences and the Binomial Theorem.

Requisites

Prerequisite(s)

Prerequisite(s) (must be taken before)
MATH-096 or MATH-094 (with a grade of C or better) or placement in MATH-105. California law (AB 705) allows placement of students in college-level math and clears the prerequisite for this course. Completion of high school Intermediate Algebra/Algebra 2 or equivalent course is highly recommended. Students who have not completed Intermediate Algebra are more likely to be successful in Statistics (Math 140) or Ideas of Mathematics (Math 115).

Codes

TOP Code (CB 03)

1701.00 - Mathematics, General

Student Accountability Model (SAM) Priority Code (CB 09)
E - Non-Occupational

Noncredit Category (CB 22)
Y - Credit Course

Grading Option
Letter grade OR P/NP

Only Pass/No Pass
No

Historical Minimum Qualifications
Mathematics (Masters Required)

Is this course approved for or proposed for Option A?
Yes

GE Information

Check GE Types Requested
AA/AS G - Math Competency

CSU Area(s)

Approved CSU Area
B4

IGETC Area(s)

Approved IGETC Area
2A

Course Equivalencies/Comparable Transfer

Identify 3 UC or CSU campuses that offer an equivalent course.

Learning Objectives

Learning Objectives

Learning Objective
1. Analyze and investigate properties of functions;
2. Synthesize results from graphs and/or equations of functions;
3. Construct the graph of polynomial, rational, exponential, logarithmic, and piece-wise defined functions;
4. Apply transformations (vertical and horizontal shifts, stretches/shrinks and reflections) to the graph of functions;
5. Formulate the inverses of linear, quadratic (with restricted domain) and rational functions, verify they are inverses and recognize the relationship between exponential and logarithmic functions both algebraically and graphically;
6. Solve and apply rational, linear, polynomial, radical, absolute value, exponential, logarithmic and systems of equations;
7. Solve linear, nonlinear, absolute value and systems of inequalities;
8. Determine the formula and domain of a function which is a sum, difference, product, quotient and composition of two functions;
9. Apply techniques, including the Rational Root Theorem, to find all the zeros of polynomials and roots of equations;
10. Apply functions and other algebraic techniques to model real world STEM applications;
11. Transform general equations of circles, parabolas, ellipses and hyperbolas into standard form and construct their graphs which may not be centered at the origin;
12. Utilize sigma notation to find the sum of the first n terms of an arithmetic or geometric sequence as well as infinite series;

Honors Objectives

Apply algebraic concepts in a more advanced and rigorous manner to theoretical or practical applications. Develop and demonstrate proficiency in proving theorems, structuring, and writing formal proofs for students completing the pure option. Utilize algebraic techniques to solve challenging applied problems in more than one way, if possible, and evaluate the methods used (an example could be graphing vs. computing) for students completing the applied option.

Content

Course Lecture Content

Functions Definitions/terminology/theorems/properties Evaluation, simplification and arithmetic Linear Absolute value Polynomials and the characterization of their zeros Rational Radical Exponential Logarithmic Domain Graph of FunctionsGraph utilizing horizontal and vertical asymptotes Intercepts Rational Piecewise defined Polynomials Exponential Logarithmic Domain and range Transformations Vertical and horizontal shifts Vertical and horizontal stretches and shrinks Reflections Quadratic Absolute Value Radical Rational Exponential Logarithmic Inverse Functions Definitions/terminology/theorems Horizontal line test One to One functions Verify functions are inverses of each other Graph inverses, note the y=x symmetry Find the inverse of a function Algebra of Functions Definitions/terminology/theorems Arithmetic Composition Domain and range InequalitiesDefinitions/terminology/theorems Solutions algebraically and graphically Interval notation Linear Nonlinear Absolute value Systems of Equations and InequalitiesDefinitions/terminology/theorems Substitution and addition methods Solve Graph Linear and nonlinear Complex NumbersDefinitions/terminology/theorems/properties Powers of i Addition, subtraction, multiplication and division of complex numbers Applications Polynomial EquationsDefinitions/terminology/theorems The Remainder Theorem The Factor Theorem Synthetic division Rational Root Theorem Descartes' rule of signs Upper and lower bounds Construction of polynomials of minimal degree having specified zeroes Characterization of the zeros of polynomials Exponential and Logarithmic FunctionsDefinitions/terminology/theorems The number e Rewrite exponential form in logarithmic form, and vice versa. Solve for the base, argument, or value of a logarithm Properties of logs Change of base formula Solutions to exponential and logarithmic equations Applications Conic SectionsDefinitions/terminology/theorems Equations and graphs of circles Equations and graphs of parabolas Equations and graphs of ellipses Equations and graphs of hyperbolas Sequences Definitions/terminology/theorems Summation notation Arithmetic and geometric sequences Arithmetic and geometric series Infinite series

Honors Content

The topics covered in Math 105H are the same as those covered in Math 105, however students in Math 105H will also complete special topics, as determined in collaboration with the instructor. Students in Math 105H will be exposed to the rigor and wider scope of topics of mathematical concepts to learn to write proofs, and/or connection between mathematical concepts to real-life scenarios. The pure option will emphasize on types and structure of mathematical proofs as well as on how to write rigorous proofs through proven algebra theorems. The applied option will cover challenging applications from engineering, economics, biology, geology, and/or physics.

Methods of Instruction

Method

Discussion

Integration

Teachers will guide the class in discussion of how to analyze the symmetry of an equation in two variables, and determine the domain and range of polynomial, radical, rational, exponential, logarithmic, and inverse functions.

DE Adaptations for MOI

Discussion will take place through the CMS course management features such as an asynchronous discussion board, group chat, email, and a virtual classroom/white board.

Method

Group work:

Integration

Students will work in groups of 3 to 4 people to use the Rational Root Theorem to find all the zeros of a given polynomial or apply Cramer's Rule to solve a linear system of three equations in three variables and to use sigma notation to find the sum of the first n terms of an arithmetic or geometric sequence.

DE Adaptations for MOI

Students will collaborate using the CMS discussion board, chat, email, or optionally in person to solve problems at the level of college algebra.

Method

In-class Exercises

Integration

Students will complete in-class exercises to determine the formula and domain of a function which is a sum, difference, product, quotient and composition of two functions and formulate the inverses of one-to-one linear, quadratic (with restricted domain) and rational functions.

DE Adaptations for MOI

In lieu of in-class exercises, students will be required to determine the formula and domain of a function which is a sum, difference, product, quotient and composition of two functions and formulate the inverses of one-to-one linear, quadratic (with restricted domain) and rational functions. This activity could take place in a threaded discussion within the CMS.

Method

Lecture

Integration

Instructors will lecture to present algebraic terminology and demonstrate how to solve absolute value, quadratic, and rational inequalities as well as polynomial, exponential and logarithmic equations.

DE Adaptations for MOI

Lecture will be accomplished using instructor or publisher prepared Power Point or web based presentation that meet accessibility requirements with closed captions or transcripts. Demonstration of theory, concepts, definitions and example problems will be supplied through the use of web based lectures (Power Point), the use of a virtual classroom/whiteboard, and discussion board through the college course management system (CMS). All technologies used must be ADA compliant.

Method

Mediated Learning

Integration

During class, students will be able to use technology to construct the graph of polynomial, rational, exponential, logarithmic, and piece-wise defined functions along with translations, reflections and stretches of these graphs and transform general equations of circles, parabolas, ellipses and hyperbolas into standard form and construct their graphs.

DE Adaptations for MOI

Students will use online graphing tools and technology to construct the graph of polynomial, rational, exponential, logarithmic, and piece-wise defined functions along with translations, reflections and stretches of these graphs and transform general equations of circles, parabolas, ellipses and hyperbolas into standard form and construct their graphs. The CMS will be used for this. The CMS must be ADA compliant.

Additional Methods of Instruction for Honors

Honors students will meet with instructor (one-on-one or group) no less than three times during the semester to discuss and select one of the options provided: Proof, Applied or Proof/Applied. The purpose of these meetings is to develop/discuss proof techniques and/or the solutions to the selected Honors course assignments.

Methods of Evaluation

Method

A final exam

Integration

A final exam must be given at the end of the course, measuring the student's mastery of solving absolute value, quadratic, and rational inequalities and solve polynomial, exponential and logarithmic equations as well as their ability to solve application problems, and determine the domain and range of polynomial, radical, rational, exponential, logarithmic, and inverse functions. The final should count for no less than 20% and no more than 40% of the course grade.

Method

Class Work

Integration

Students will be graded on their ability to accurately determine the formula and domain of a function which is a sum, difference, product, quotient and composition of two functions and formulate the inverses of one-to-one linear, quadratic (with restricted domain) and rational functions. Class work may account for no more than 10% of the course grade.

DE Adaptations for MOE

Students will do classwork by printing out worksheets from the CMS. They will submit their work through the platform. The instructor will give a grade on the CMS for the assignment and post the answers to the class work.

Method

Exams/Tests

Integration

At least four tests are to be given to measure the student's ability to correctly use the Rational Root Theorem to find all the zeros of a given polynomial or to solve a linear system of three equations in three variables, solve a system of inequalities and to use sigma notation to find the sum of the first n terms of an arithmetic or geometric sequence. Tests may account for no less than 40% and no more than 60% of the course grade.

DE Adaptations for MOE

Tests will include multiple choice, true/false, and short answer question. They will be taken at an approved testing site such as the college testing center. The exams will be a paper test or through the CMS. Even if it is through the CMS the student must turn in all paperwork used for the test so the instructor can see the work. The student can get the test back once it is graded by going back to the test center to pick up and the instructor will post the solutions to the exam. If a student is taking it off campus then the instructor will email the graded test to those students.

Method

Group Projects

Integration

Students will be assessed on how well their group is able to use the Rational Root Theorem to find all the zeros of a given polynomial or apply Cramer's Rule to solve a linear system of three equations in three variables and to use sigma notation to find the sum of the first n terms of an arithmetic or geometric sequence. Group Projects may account for no more than 10% of the course grade.

DE Adaptations for MOE

Students will be assigned to groups and they will share their work with each other either through email or the online course management from the school. They will submit their work through the CMS. The instructor will grade the assignment along with comments, scan it, and email it to the students.

Method

Homework

Integration

Student's homework assignments will be graded on their ability to accurately determine the formula and domain of a function which is a sum, difference, product, quotient and composition of two functions and formulate the inverses of one-to-one linear, quadratic (with restricted domain) and rational functions. Homework may account for no more than 15% of the course grade.

DE Adaptations for MOE

For homework students will be assigned problems to complete within the CMS. If a publisher website will be used for assignments (optional) it must be WCAG 2. AA standards compliant. It may account for no more than 15% of the course grade. Student's assignments will be graded on their ability to accurately determine the formula and domain of a function which is a sum, difference, product, quotient and composition of two functions and formulate the inverses of one-to-one linear, quadratic (with restricted domain) and rational functions. The CMS or publisher website will grade the homework and students will get automatic feedback.

Method

Quizzes

Integration

Students will be graded on their ability to construct the graph of polynomial, rational, exponential, logarithmic, and piece-wise defined functions along with translations, reflections and stretches of these graphs and transform general equations of circles, parabolas, ellipses and hyperbolas into standard form and construct their graphs. Quizzes may account for no more than 15% of the course grade.

DE Adaptations for MOE

Quizzes may account for no more than 15% of the course grade. Students will be graded on their ability to construct the graph of polynomial, rational, exponential, logarithmic, and piece-wise defined functions along with translations, reflections and stretches of these graphs and transform general equations of circles, parabolas, ellipses and hyperbolas into standard form and construct their graphs within the assignment editor of the CMS or publisher website. The CMS or website will grade each problem automatically.

Evaluation of Honors assignments

For each enrichment assignment, the criteria that will be used to evaluate will include accuracy of the completed assignments, completeness of the assignments, demonstration of understanding of the concepts through clearly providing each required step of the problems. Partial credit will be given for partial written solutions.

Students will also be evaluated based on their oral presentations during the meetings with the instructor. The criteria for evaluation will include clarity, organization, critical thinking, and mathematical accuracy.

The self-reflection essay will be evaluated on completness, correctness, content and creativity.

Assignments

Honors Assignments

Assignment

Honors students are required to complete all regular Math 105 assignments. In addition, they will select either the Pure Option or the Applied Option in collaboration with the instructor.

Assignment

Pure Option - at least one of the following:

Assignment

Prove at least two but no more than three advanced results, such as the summation formulas by mathematical induction, the properties of logarithms or the rules of exponents by mathematical induction. Each proof will be submitted to the instructor in writing, generally not exceeding one page in length, for evaluation in accordance with instructor specified deadlines.

Assignment

Research existing rigorous proofs of at least two but no more than three advanced results in algebra, such as the Fundamental Theorem of Algebra, the sum of the first n terms of an arithmetic series, or that x-y is a factor of x^n-y^n. The research should be conductred by utilizing at least two reputable sources such as mathematical journals, undergraduate textbooks or educational internet sources. The purpose of the research is to expose students to various types of proofs and to rigorous formats for proofs in mathematics. Each research will be submitted to the instructor in writing, generally not to exceed three pages in length, in accordance with the instructor specified deadlines.

Assignment

Applied Option - at least one of the following:

Assignment

Solve at least three but no more than four application problems such as the following: a)Use linear regression to find the line that best fit; b) use combinations and/or permutations to solve real-life problems; c) use properties of probability to solve real-life problems; d) use graphing calculator to solve polynomial equations and systems of equations. Projects will be submitted to the instructor in writing, generally not exceeding three pages in length, for evaluation in accordance with instructor specified deadlines.

Assignment

Write a short paper about a topic in STEM that includes applications of algebraic concepts, such as using mathematical models to track the progress of an infectious disease, or using logarithms in seismology. The short paper should include at least two reputable sources such as scientific journals, undergraduate textbooks or educational internet sources. Each short paper will be submitted in writing, not to exceed three pages in length, according to the instructor specified deadlines.

Assignment

In addition to each project submitted, a 500-word cumulative self-reflection narrative is submitted from each student regarding how the selected projects are related to the field/major the student is pursuing.

Assignment

Discussions - During the meetings (one-to-one or group) students will discuss with the instructor and/or other honors students the approach and method of solutions to the proofs from the pure option or to the application problems from the applied option.

Course Materials

Textbooks

Sullivan & Sullivan (2019). College Algebra: Concepts Through Functions 4th Pearson. ISBN: 13:9780134775784
Robert Blitzer (2018). College Algebra, 7th Pearson. ISBN: 13-9780134469911

Other Resources

Minimum Qualification

Class Size Information

Class Size

40

Key: 2095