

MATH 0029 - PRE-CALCULUS MATHEMATICS

Catalog Description

Prerequisite: Completion of MATH 27 with grade of "C" or better or placement by matriculation assessment process

Hours: 72 lecture

Description: Preparation for calculus. Study of polynomials, rational functions, exponential and logarithmic functions, trigonometric functions, systems of linear equations, matrices, determinants, rectangular and polar coordinates, conic sections, complex number systems, mathematical induction, binomial theorem, and sequences. Recommended for students who plan to take MATH 30. (CSU, UC-with unit limitation)

Course Student Learning Outcomes

- CSLO #1: Simplify expressions and solve equations of the following types: linear, quadratic (including some with complex solutions), rational, radical, absolute value, exponential, logarithmic, and trigonometric.
- CSLO #2: Interpret and construct graphs of polynomial, rational, exponential, logarithmic, and trigonometric functions, and conic sections.
- CSLO #3: Translate, model, and solve applied problems utilizing polynomial, rational, radical, exponential, logarithmic, trigonometric functions, and matrix algebra.
- CSLO #4: Logically present clear, complete, accurate, and sufficiently detailed solutions to communicate reasoning and demonstrate the method of solving problems.
- CSLO #5: Apply techniques from linear algebra and combinatorics.

Effective Term

Fall 2022

Course Type

Credit - Degree-applicable

Contact Hours

72

Outside of Class Hours

144

Total Student Learning Hours

216

Course Objectives

Through homework assignments, quizzes, exams, projects and classroom discussions, the student will:

1. Solve equations, including polynomial, radical, quadratic in form, rational, logarithmic, exponential, and literal with real and imaginary solutions.
2. Solve rational, polynomial, and absolute value inequalities.

3. Graph polynomial, rational, logarithmic, exponential, and radical functions and find any intercepts, extrema, or asymptotes.
4. Solve word problems leading to equations from objectives #1, 2, and 3.
5. Solve systems of equations or inequalities using substitution, elimination, graphing Cramer's Rule, and matrices.
6. Perform binomial expansion using Pascal's Triangle or combinatorics.
7. Identify terms and find finite or infinite sums of arithmetic and geometric sequences and series.
8. Apply "Mathematical Induction" method of proof to appropriate problems.
9. Evaluate the six trigonometric functions of special angles and their inverses.
10. Graph basic trigonometric functions and their transformations and have the ability to identify extreme values, zeros, period, asymptotes and transformations.
11. Verify trigonometric identities using valid substitutions and algebraic manipulations.
12. Generate solutions to trigonometric equations including the use of trigonometric identities.
13. Solve right and oblique triangles and related applications.
14. Use polar coordinate system to graph polar equations and evaluate roots and powers of complex numbers.
15. Analyze and graph conic sections in rectangular and polar form, labeling the center, vertices, foci, directrices, and asymptotes when applicable.
16. Sketch parametric curves and convert parametric equations into rectangular form.

General Education Information

- Approved College Associate Degree GE Applicability
 - AA/AS - Comm & Analyt Thinking
 - AA/AS - Mathematical Skills
- CSU GE Applicability (Recommended-requires CSU approval)
 - CSUGE - B4 Math/Quantitative Reasoning
- Cal-GETC Applicability (Recommended - Requires External Approval)
- IGETC Applicability (Recommended-requires CSU/UC approval)
 - IGETC - 2A Math/Quan Reasoning

Articulation Information

- CSU Transferable
- UC Transferable

Methods of Evaluation

- Problem Solving Examinations
 - Example: 1. Use complete sentences to describe the transformations needed to create the graph of $y = 4 - 3\sin(2x - \pi)$ from the graph of $y = \sin x$. This question is graded based on the use of appropriate mathematical vocabulary, order, and accuracy of the stated transformations. 2. Solve the system of equations, $2x - z = 2, 6x + 5y + 3z = 7, 2x - y = 4$ by using Gaussian Elimination. This question is graded based on the clarity, completeness, and correctness of the method used and of the solutions found.

Repeatable

No

Methods of Instruction

- Lecture/Discussion
- Distance Learning

Lecture:

1. In class, small group collaborative learning activity - students will discuss the strategies for sketching graphs of rational functions. This discussion should include methods for finding all vertical, horizontal, and slant asymptotes, as well as finding all intercepts of the graph. The instructor will circulate and ask clarifying questions as the students complete this task (Objective 3).
2. Interactive lecture format is used to develop the concept of sequences. To help students understand the commonalities and differences between arithmetic and geometric sequences, the instructor will illustrate the concepts both graphically and algebraically. Students will participate verbally and will work several examples (Objective 7).

Distance Learning

1. In small virtual groups students will create a wiki-page demonstrating the strategies for sketching graphs of rational functions. This page should include methods for finding all vertical, horizontal, and slant asymptotes, as well as finding all intercepts of the graph. The instructor will then lead a group discussions with clarifying questions (Objective 3).
2. Video lectures are used to develop the concept of sequences. To help students understand the commonalities and differences between arithmetic and geometric sequences, the instructor will illustrate the concepts both graphically and algebraically. Students will then participate in a assignment where they will post work of an example that will get peer review (Objective 7).

Typical Out of Class Assignments

Reading Assignments

1. In the text read about real world applications of parabolas. Note the significance of the placement of the focus and the importance of the length of the focal diameter and be prepared to discuss in class.
2. In the text, read about solving triangles using the Law of Cosines and Law of Sines. Be sure you can distinguish when to appropriately use one or the other and be prepared to discuss in class.

Writing, Problem Solving or Performance

1. Find all zeros for a given 5th degree polynomial using the Rational Zeros Theorem, synthetic division, and other relevant theorems. Use your results to sketch a graph of the function.
2. After the release of radioactive material into the atmosphere from a nuclear power plant at Chernobyl (Ukraine) in 1986, the hay in Austria was contaminated by iodine 131 (half-life 8 days). If it is safe to feed the hay to cows when 10% of the iodine 131 remains, how long did the farmers need to wait to use the hay?

Other (Term projects, research papers, portfolios, etc.) Required Materials

- Precalculus
 - Author: James Stewart
 - Publisher: Cengage
 - Publication Date: 2016
 - Text Edition: 7th
 - Classic Textbook?: No
 - OER Link:
 - OER:
- Precalculus
 - Author: Michael Sullivan
 - Publisher: Pearson
 - Publication Date: 2020
 - Text Edition: 11th
 - Classic Textbook?: No
 - OER Link:
 - OER:

Other materials and-or supplies required of students that contribute to the cost of the course.