



## MATH 28s - Precalculus with Support

### Catalog Description

**Transfer Status:** CSU/UC

**Prerequisite:** Trigonometry or equivalent

**Unit(s):** 4.00

**Activity:** 136.00 Contact hours/68.00 Out of class hours/204.00 Total hours/4.00 Unit(s)

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**Course Description:** This course is preparation for calculus. It covers advanced algebra topics beyond the scope of Intermediate Algebra as well as the theory and applications of Trigonometry, both of which are necessary for success in calculus. Topics include polynomial, absolute value, radical, exponential, logarithmic, and trigonometric functions and their graphs; analytic geometry, and polar coordinates. This course will contain the same curriculum as MATH 28 but will also have embedded support to review key intermediate algebra and geometry concepts. This course emphasizes in-class activities and applications.

### Objectives

Upon successful completion of this course, the student should be able to:

1. Graph functions and relations in rectangular coordinates and polar coordinates
2. Synthesize results from the graphs and/or equations of functions and relations
3. Apply transformations to the graphs of functions and relations
4. Recognize the relationship between functions and their inverses graphically and algebraically
5. Solve and apply equations including rational, linear, polynomial, exponential, absolute value, radical, and logarithmic, and solve linear, nonlinear, and absolute value inequalities
6. Solve systems of equations and inequalities
7. Apply functions to model real world applications
8. Identify special triangles and their related angle and side measures
9. Evaluate the trigonometric function of an angle given in degree and radian measure
10. Manipulate and simplify a trigonometric expression
11. Solve trigonometric equations, triangles, and applications
12. Graph the basic trigonometric functions and apply changes in period, phase and amplitude to generate new graphs
13. Prove trigonometric identities
14. Factor quadratic and higher order polynomials
15. Add, subtract, multiply, and divide both real and complex numbers, as well as rational and radical expressions, and polynomials
16. Apply appropriate formulas from Geometry, such as area, perimeter, and volume formulas related to plane figures and regular solids, and analyze congruent triangles and angles formed by parallel lines cut by a transversal
17. Translate words into equations
18. Use technology, such as a graphing or online calculator, to evaluate logarithmic and exponential expressions, graph rectangular and polar equations, convert between decimals and fractions, approximate square roots, and interpret scientific notation

### Course Content

Topic Titles / Suggested Time Topic	<u>Lecture/Activity</u>	<u>Lec Hrs</u>	<u>Act Hrs</u>
Functions including linear, polynomial, rational, radical, exponential, absolute value, logarithmic, trigonometric; definitions, evaluation, domain, range			16.00
Inverses of functions			6.00
Algebra of functions			6.00
Graphs of functions including asymptotic behavior, intercepts, and vertices			6.00
Transformations of quadratic, absolute value, radical, rational, logarithmic, exponential functions			6.00
Equations including rational, linear, radical, polynomial, exponential, trigonometric, logarithmic, and absolute value			16.00
Linear, nonlinear, and absolute value inequalities			6.00
Systems of equations and inequalities			6.00
Characterization of real and complex zeros of polynomials			6.00
Unit circle and right triangle trigonometry			6.00
Trigonometric and inverse trigonometric identities and formulas			10.00

<u>Topics</u>	<u>Lec Hrs</u>	<u>Act Hrs</u>
Graphing trigonometric functions: period, amplitude, phase shift, inverse trigonometric functions		10.00
Polar coordinates		6.00
Simplify expressions containing real and complex numbers, including radical, rational, and polynomial expressions.		6.00
Find the area and perimeter of plane figures and the volume of regular solids; use congruent triangles and angles formed by parallel lines cut by a transversal to solve for missing parts of plane figures		6.00
Factor quadratic and higher order polynomials		6.00
Translate words into equations		6.00
Use technology, such as a graphing or online calculator, to evaluate logarithmic and exponential expressions, graph rectangular and polar equations, convert between decimals and fractions, approximate square roots, and interpret scientific notation.		6.00
<b>Total Hours:</b>		<b>0.00 136.00</b>

### Methods of Instruction

- A. Class Activities
- B. Discussion
- C. Group Discussions
- D. Homework: Students are required to complete one hour of outside-of-class homework for every two hours of activity
- E. Instructor Demonstrations
- F. Problem-Solving Sessions

### Methods of Evaluation

- A. Exams/Tests
- B. Quizzes
- C. Homework
- D. Class participation
- E. Final Examination

### Examples of Assignments

#### Reading Assignments

1. Read the section in the textbook on the Law of Sines and explain when its use will lead to one, two, or no solutions.
2. Read the section in the textbook on Transformations and be able to graph functions whose equations can be derived by transforming one of the six basic functions:  $y = x$ ,  $y = |x|$ ,  $y = x^2$ ,  $y = x^3$ ,  $y = \sqrt{x}$ , and  $y = 1/x$ .

#### Writing Assignments

1. Given a polynomial function of degree  $n$ , explain the procedure to follow for finding its zeros. Be sure to discuss the relationship between the zeros and the  $x$ -intercepts of the function, as well as how to tell if the graph of the function crosses the  $x$ -axis or simply touches it. Further, explain how the Leading Coefficient Test can be used to describe the behavior of the function as  $x$  approaches infinity from both the left and the right.
2. Explain the procedure to follow for identifying holes and asymptotes of the graph of a rational function. Be sure to discuss how to tell if a zero of the denominator of a rational function - call it  $C$  - is the  $x$ -coordinate of a hole, or if the equation  $x = C$  is the equation of a vertical asymptote. Assume you are explaining this to a group of students hearing this for the first time and write a detailed explanation.

#### Out-of-Class Assignments

1. Review the section on Transformations and do the problems assigned by the instructor, showing your work.
2. Review the section on the Law of Sines and do the problems assigned by the instructor, showing your work.

### Recommended Materials of Instruction

- Jay Abramson. (2021). Precalculus. *Openstax*, 2. <https://openstax.org/details/books/prec calculus-2e>.
- Revathi Narasimhan. (2020). Precalculus. *xyz textbooks*, 2. ISBN: 978-1-63098-132-7.
- Michael Sullivan. (2023). Concepts through functions, A unit circle approach to trigonometry. *Pearson*, 5. 9780137945139.

### Minimum Qualifications

Mathematics (Masters Required)

**Created/Revised by:** Hauser, Juliet

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