South Central College

MATH 130 Precalculus Mathematics

Course Outcome Summary

Course Information

Description This is an accelerated course covering many topics from both College Algebra and Trigonometry. These include functions, graphs of functions, analytic geometry of the conic sections, systems of equations and inequalities, elementary matrix operations and determinants, properties and applications of exponential, logarithmic and trigonometric functions, complex numbers, vectors, polar coordinates and elementary combinatorics. Should not be taken for credit in addition to either MATH 120 or MATH 125. (Prerequisites: A score of 86 or higher on the College Level mathematics portion of the Accuplacer test.) (MNTC 4: Mathematical/Logical Reasoning)

Total Credits 4

Total Hours 64

Pre/Corequisites

A score of 86 or higher on the College Level mathematics portion of the Accuplacer test.

Institutional Core Competencies

Critical and Creative Thinking - Students will be able to demonstrate purposeful thinking with the goal of using a creative process for developing and building upon ideas and/or the goal of using a critical process for the analyzing and evaluating of ideas.

Course Competencies

1. Graph elementary functions and relations accurately

Learning Objectives

Graph linear functions
Graph circles from their equations
Deduce the equation of a circle from a given center and radius
Compute vertex, axis of symmetry, increasing/decreasing behavior and intercepts of a parabola
Calculate the domain and range of a quadratic function
Graph more complex functions using transformations

2. Describe functions in terms of the formal definition

Learning Objectives

Define relations and functions precisely
Apply the four binary arithmetic operators to functions
Create composite functions

Prove a function is one-to-one
Describe the relationship of a function to its inverse

3. Describe the local and global behavior of a given polynomial function

Learning Objectives
Locate special points on the graphs of polynomial functions
Graph polynomial functions using these special points
Define what it means for a function to be an increasing or decreasing function on an interval

4. Compute the roots of polynomial equations

Learning Objectives
Find rational zeroes using the Rational Root Theorem
Predict polynomial behavior using Descartes' Rule of Signs
Approximate real zeroes of polynomials

5. Evaluate expressions containing exponentials

Learning Objectives
Define the general exponential function
Find the domain and range of exponential functions
Define the exponential function with base e
Graph exponential functions, along with any asymptotes
Deduce laws of exponential growth and decay
Model real-world problems using exponentials

6. Evaluate expressions containing logarithms

Learning Objectives
Simplify logarithmic expressions using Napier's properties
Define common and natural logarithms
Change logarithmic expressions from one base to another
Graph logarithmic functions

7. Solve equations containing exponentials and logarithms

Learning Objectives
Specify behavior of such equations in terms of domain and range of the functions
Solve certain exponential equations exactly
Solve certain logarithmic equations exactly
Approximate solutions to other exponential and logarithmic equations

8. Model real-world problems with radian measurements of angles

Learning Objectives
Define the radian
Convert between radian and degree measurements
Apply radian measure to real-world problems

9. Define the six trigonometric functions as real valued functions of a real variable

Learning Objectives
Explain the wrapping function and related circular functions
Deduce domains and ranges for the six trigonometric functions
Derive the Pythagorean and other simple properties of the trigonometric functions

10. Solve right triangle problems using trigonometry

Learning Objectives
Model real-world problems using right triangles
Solve for the missing parts in such problems using trigonometry

11. Graph trigonometric functions

Learning Objectives
Check for symmetry among the six trigonometric functions

Locate any asymptotes
Graph combination of trigonometric and algebraic functions using transformations

12. Derive the six inverse trigonometric functions

Learning Objectives

Find the domains and ranges of the inverse trigonometric functions
Deduce other properties of the inverse trigonometric functions
Graph the inverse trigonometric functions

13. Derive useful results in analytic trigonometry

Learning Objectives

Prove certain trigonometric identities
Solve certain trigonometric conditional equations

14. Compute the trigonometric functions of related angles

Learning Objectives

Explain the trigonometric co-functions
Compute the trigonometric functions of half-angles
Compute the trigonometric functions of double-angles
Find the trigonometric functions of a sum or difference of angles
Convert trigonometric expressions of sums to products
Convert trigonometric expressions of products to sums

15. Apply trigonometry to oblique triangles

Learning Objectives

Find the remaining parts of a triangle using the Law of Sines
Find the remaining parts of a triangle using the Law of Cosines
Apply (a) and (b), above, to real-world mensuration problems

16. Interpret certain functions in polar coordinate form

Learning Objectives

Transform functions from Cartesian to polar coordinate form
Transform functions from polar coordinate to Cartesian form
Deduce symmetry properties of functions expressed in polar coordinate form
Graph functions expressed in polar coordinate form

17. Express certain physical phenomena in terms of vectors

Learning Objectives

Define geometric vectors
Define algebraic vectors
Establish properties of vectors and vector operations

18. Perform operations on complex numbers

Learning Objectives

Review complex number arithmetic
Express complex numbers trigonometrically
Graph complex numbers in the Cartesian and polar planes
Use DeMoivre's Theorem to simplify powers of complex numbers

19. Solve systems of linear equations using row operations or determinants

Learning Objectives

Solve simple systems of linear equations using shorthand matric concepts
Solve systems of linear equations using Gauss-Jordan elimination
Deduce basic properties of matrices and determinants
Solve systems of linear equations with the Cramer's Rule

20. Solve systems of linear inequalities

Learning Objectives

Solve systems of linear inequalities in two variables
Solve applied problems using elementary linear programming

21. Predict the behavior of well-known sequences

Learning Objectives
Generate individual terms from the definition of a sequence
Create the most likely general term of a given finite sequence

22. Define arithmetic sequences

Learning Objectives
Generate individual terms in an arithmetic sequence
Deduce the general term of an arithmetic sequence

23. Define geometric sequences

Learning Objectives
Generate individual terms in a geometric sequence
Deduce the general term of a geometric sequence
Apply geometric sequences to growth and decay problems

24. Sum an arithmetic series

Learning Objectives
Interpret the sigma sum notation
Compute a sum knowing the first term, number of terms and the common difference
Find the fourth item knowing any three items of part (b), above
Visualize an arithmetic series geometrically
Interpret the method of (d), above, in the context of what the ancient Greeks have given us

25. Sum a geometric series

Learning Objectives
Compute a sum knowing the first term, number of terms and the common ratio
Sum an infinite geometric series when the ratio is appropriate

26. Expand expressions using the Binomial formula

Learning Objectives
Use Pascal's Triangle to rapidly compute coefficients
Use the definition to compute the coefficients
Find specific terms in a binomial expansion
Expand a binomial raised to a power

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