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
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**
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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