College Algebra/Trigonometry/Statistics (Functions and Trigonometry) Essential Curriculum

UNIT 1: Equations and Modeling

Goal. The students will demonstrate the ability to solve various types of equations that have both real and imaginary roots.

Objectives – The student will be able to:
a. Sketch graphs of equations and find x- and y- intercepts of graphs.
b. Solve linear equations in one variable.
c. Solve equations involving fractional expressions.
d. Solve quadratic equations by factoring, quadratic formula, and graphing.
e. Solve systems of equations.
f. Solve polynomial, radicals, fractional, and absolute value equations.
g. Use different types of equations to model and solve real-world problems.

UNIT 2: Function Theory

Goal. The students will demonstrate the ability to identify graphs, domain and range, intercepts, and maxima and minima of various functions.

Objectives – The student will be able to:
a. Identify relations as functions.
b. Use function notation and evaluate functions.
c. Find the domain and range of functions.
d. Use functions to model and solve real-world problems.
e. Find the zeros of functions.
f. Determine where a function is increasing or decreasing and find the maxima and minima.
g. Identify and graph linear, step, and other piecewise-defined functions.
h. Identify even and odd functions.
i. Recognize graphs of common functions as well as transformations of these graphs.
j. Add, subtract, multiply, and divide functions.
k. Find compositions of one function with another function.
l. Find and verify inverses of functions.

UNIT 3: Polynomial Functions

Goal. The students will demonstrate the ability to use a problem-solving approach to solve polynomial equations, both with and without the use of technology, and sketch and analyze graphs of polynomial functions.

Objectives – The student will be able to:
   a. Analyze and sketch graphs of quadratic functions.
   b. Sketch graphs of polynomial functions using transformations, end behavior, and zeros.
   c. Divide polynomials using long and synthetic division.
   d. Apply the remainder and factor theorems to polynomial functions.
   e. Determine the zeros of polynomial functions algebraically and graphically.
   f. Use polynomial functions to model and solve real-world problems.
   g. Use direct, inverse, and joint variation to model and solve real-world problems.

UNIT 4: Rational Functions

Goal. The students will demonstrate the ability to describe, interpret, analyze and apply rational functions to real-world problems.

Objectives – The student will be able to:
   a. Determine the domain of a rational expression.
   b. Simplify, add, subtract, multiply, and divide rational expressions.
   c. Simplify complex fractions.
   d. Determine the horizontal, vertical, and slant asymptotes of rational functions.
   e. Analyze and sketch graphs of rational functions.
   f. Use rational functions to model and solve real-world problems.

UNIT 5: Exponential and Logarithmic Functions

Goal. The students will demonstrate the ability to use a problem-solving approach to use the laws of exponents and logarithms and apply them to real-world situations.

Objectives – The student will be able to:
   a. Use properties of integer and rational exponents.
   b. Use scientific notation.
   c. Simplify and combine radical expressions.
   d. Rationalize denominators.
   e. Recognize and evaluate exponential functions, including base e.
   f. Sketch and analyze the graph of an exponential function.
   g. Recognize and evaluate logarithmic functions, including the natural logarithm.
   h. Sketch and analyze the graph of a logarithmic function.
   i. Use properties of logarithms to evaluate and rewrite logarithmic expressions.
   j. Solve exponential and logarithmic equations.
   k. Use exponential and logarithmic functions to model and solve real-world problems.

UNIT 6: Introduction to Trigonometry

    Goal. The students will demonstrate the ability to define trigonometric ratios and apply trigonometry to solve real-world problems.

      Objectives – The student will be able to:
  a. Describe angles using degree and radian measure.
  b. Convert between degree and radian measures.
  c. Model and solve real-world problems involving arc length and speed.
  d. Evaluate the six trigonometric functions.
  e. Use reference angles to evaluate trigonometric functions.
  f. Use trigonometric functions and right triangle relations to model and solve real-world problems.
  g. Use the fundamental trigonometric identities to evaluate trigonometric functions, simplify trigonometric expressions, and rewrite trigonometric expressions.
  h. Verify trigonometric identities.

UNIT 7: Trigonometric Graphs and Equations

    Goal. The students will demonstrate the ability to sketch and analyze trigonometric graphs, solve trigonometric equations and apply trigonometry to solve real-world problems.

      Objectives – The student will be able to:
  a. Sketch and analyze the graphs of sine and cosine functions, including amplitude, period and phase shift.
  b. Sketch and analyze the graph of the tangent function, including period and phase shift.
  c. Solve trigonometric equations (limited to sine, cosine, and tangent) in basic algebraic and quadratic form.
  d. Use the Law of Sines to solve triangles (AAS, ASA, or SSA).
  e. Use the Law of Sines to model and solve real-world problems.

UNIT 8: Sequences and Series

    Goal. The students will demonstrate the ability to identify and evaluate arithmetic and geometric sequences and series.

      Objectives – The student will be able to:
  a. Use sequence notation to write the terms of a sequence.
  b. Use factorial notation.
  c. Use summation notation.
  d. Recognize and write arithmetic sequences.
  e. Find an nth partial sum of an arithmetic sequence.
  f. Recognize and write geometric sequences.
  g. Find the nth partial sum of a geometric sequence.
  h. Find the sum of an infinite series.
  i. Use arithmetic and geometric sequences and series to model and solve real-world problems.