Precalculus G/T
Essential Curriculum

UNIT I: Relations, Functions, Graphs, and Inequalities

Goal. The student will demonstrate the ability to use a problem-solving approach in applying graphing utilities to investigate symmetry and geometric transformations of special functions.

Objectives - The student will be able to:

a. Determine the symmetry of a graph.
b. Use symmetry to sketch a graph.
c. Identify and graph Greatest Integer Function.
d. Identify and graph Absolute Value Function.
e. Identify and graph Piecewise Functions.
f. Solve inequalities involving absolute value.

UNIT II: Trigonometric Functions

Goal. The student will demonstrate the ability to use a problem-solving approach in working with trigonometric functions and applying them to real-world situations.

Objectives – The student will be able to:

a. Measure angles in degrees and radians.
b. Find measures of coterminal angles.
c. Convert between degree and radian measure.
d. Measure arcs and sectors of circles.
e. Define sine, cosine and tangent as ratios.
f. Solve right triangles given partial information about sides and angles.
g. Evaluate the sine and cosine functions of an angle given a point on its terminal side.
h. Define the six trigonometric functions.
i. Define the circular functions in connection with the trigonometric functions.
j. Find and state the six trigonometric functions of special and quadrantal angles.
k. Find and state the six circular functions of special and quadrantal angles.
l. Find decimal approximations for values of trigonometric functions.
m. Find the degree measure of an angle when the trigonometric function value is given.
n. Find the radian measure of an angle when the circular function value is given.
o. State and prove the reciprocal, ratio, Pythagorean, and odd-even identities.

UNIT III: Analytic Trigonometry and Applications

Goal. The student will demonstrate the ability to use a problem-solving approach in analyzing the graphs of the trigonometric functions and their inverses, and applying the trigonometric functions to solve triangles.

Objectives - The student will be able to:

a. Graph the sine and cosine functions.
b. Find the amplitude, period, and phase shift from a function equation.
c. Graph the sine or cosine function when given the amplitude, period, and phase shift.
d. Graph and apply transformations to the tangent, cotangent, secant and cosecant functions.
e. Graph trigonometric equations by addition of ordinates.
f. Evaluate inverse trigonometric functions.
g. Graph inverse trigonometric functions.
h. Use the law of sines to solve a triangle when the measure of two angles and one side are given.
i. Use the law of cosines when the measures of two sides and the included angle are given or when the measures of three sides are given.
j. Find the area of a triangle when given the measures of two sides and the I included angle or one side and two angles.

UNIT IV: Trigonometric Equations and Identities

Goal. The student will demonstrate the ability to use a problem-solving approach in applying trigonometric identities and solving trigonometric equations and inequalitites.

Objectives - The student will be able to:

a. Develop and use formulas for the trigonometric functions of a sum or difference of two angle measures.
b. Verify trigonometric identities graphically.
c. Develop and use the double-angle identities.
d. Develop and use the half-angle identities.
e. Solve trigonometric equations and inequalities.
f. Solve trigonometric equations and inequalities in quadratic form.

UNIT V: Quadratic Functions

Goal. The student will demonstrate the ability to use a problem-solving approach in investigating quadratic functions.

Objectives - The student will be able to:

a. Apply transformations to the graphs of quadratic functions.
b. Graph quadratic functions.
c. Determine the maximum and minimum values of a quadratic function.
d. Identify intervals where functions are increasing and decreasing.
e. Solve higher order polynomial equations.
f. Solve higher order inequalities.

UNIT VI: Polynomial Functions

Goal. The student will demonstrate the ability to use a problem-solving approach in investigating polynomial functions.

Objectives - The student will be able to:

a. Determine if a function is continuous.
b. Determine the end behavior of a function.
c. Find the real zeros of polynomial functions.
d. Find the complex zeros of polynomial functions by algebraic methods.
e. Determine the absolute maximum and minimum using a graphing utility.
f. Determine the local (relative) maximum and minimum using a graphing utility.

UNIT VII: Rational and Radical Functions

Goal. The student will demonstrate the ability to use a problem-solving approach in investigating rational and radical functions.

Objectives - The student will be able to:

a. Determine the composition of two or more functions.
b. Find the domain and range of rational functions.
c. Find the end behavior of rational functions.
d. Solve equations and inequalities involving rational function.
e. Find the domain and range of radical functions.
f. Solve equations and inequalities involving rational functions.
g. Find the domain and range of radical functions.
h. Graph radical functions.
i. Solve equations and inequalities involving radical functions.

UNIT VIII: Logarithmic and Exponential Functions

Goal. The student will demonstrate the ability to use a problem-solving approach in investigating logarithmic and exponential functions.

Objectives - The student will be able to:

a. Define and evaluate the sum, difference, product, and quotient of functions.
b. Find the inverse of a relation or function.
c. Determine if the inverse is a function.
d. Graph exponential functions.
e. Solve exponential equations.
f. Define the natural base e.
g. Express the inverse of an exponential function as a logarithmic function.

h. Evaluate logarithms.
i. Use the properties of logarithms.
j. Graph logarithmic functions in base 10 and base e.
k. Use change of base formulas to graph logarithmic functions in any base.
l. Solve equations involving logarithms.
m. Use logarithms to solve exponential equations.
n. Solve real-world problems involving exponential growth and decay, and compound interest.

UNIT IX: Complex Numbers and Polar Equations

Goal. The student will demonstrate the ability to use a problem-solving approach in exploring the relationships between the complex plane, the Cartesian plane and the polar coordinate system

Objectives - The student will be able to:
a. Graph complex numbers on the complex plane.
b. Find the trigonometric form of complex numbers.
c. Apply DeMoivre's Theorem to complex numbers in trigonometric form.
d. Change Cartesian coordinates to polar coordinates the vice versa.
e. Plot points using polar coordinates.
f. Graph polar equations.
g. Change equations from rectangular form to polar form and vice versa.

UNIT X: Vector and Parametric Equations

Goal. The student will demonstrate the ability to use a problem-solving approach in exploring the properties of vectors and applications of parametric equations.

Objectives - The student will be able to:
a. Define a vector.
b. Find the sum and difference of two vectors.
c. Multiply a vector by a scalar.
d. Define a unit vector.
e. Find the norm of a vector.
f. Find the direction of a vector.
g. Define parallel vectors.
h. Define perpendicular vectors.
i. Write a given vector as a linear combination of two basis vectors.
j. Deter whether two vectors are parallel or perpendicular.
k. Find the angle between any two vectors.
l. Solve distance and motion problems using vectors.
m. Define parametric equations.
n. Graph parametric equations.
o. Graph polar equations using parametric form.
p. Apply parametric equations to the solution of motion problems.

UNIT XI: Discrete Mathematics

Goal. The student will demonstrate the ability to use a problem-solving approach in applying concepts of discrete mathematics to various situations.

Objectives - The student will be able to:

a. Find a rule for a sequence.
b. Find specified terms and the common difference in an arithmetic sequence.
c. Find specified terms and the common ratio in a geometric sequence.
d. Determine whether a sequence converges or diverges.
e. Define a series.
f. Find the partial sum of an arithmetic or a geometric series.
g. Find the sum of a convergent infinite geometric series.
h. Use the binomial theorem to expand a binomial.
i. Solve problems involving binomial distributions.
j. Prove statements using the principle of mathematical induction.