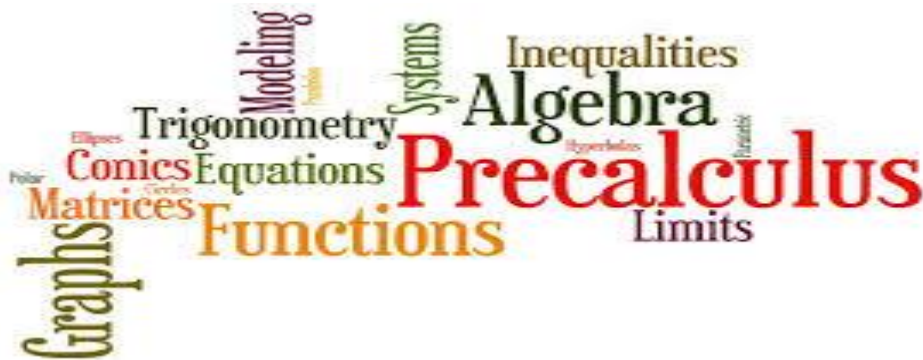


NFC ACADEMY



COURSE OVERVIEW

Pre-calculus is a full-year, high school credit course that is intended for the student who has successfully mastered the core algebraic and conceptual geometric concepts covered in the prerequisite courses: Algebra I, Geometry, and Algebra II. This honor's level course primarily focuses on the skills and methods of analytic geometry and trigonometry while investigating further relationships in functions, probability, number theory, limits, and the introduction of derivatives.

OBJECTIVES

- **RELATIONS AND FUNCTIONS:** Student will examine functions, inverses of functions and combine functions to verify inverses, as well as distinguish between linear and quadratic functions.
- **FUNCTIONS:** Student will solve polynomials using the quadratic theorem, remainder theorem and factor theorem, identify graphs of different polynomial equations and inequalities, and understand complex numbers.
- **TRIGONOMETRIC FUNCTIONS:** Student will identify and solve for missing components of trigonometric functions, calculating trigonometric values for different angles and relate degrees to radians, and radians to degrees.
- **CIRCULAR FUNCTIONS AND THEIR GRAPHS:** Student will use parametric equations with trigonometric operations to model and solve

problems, and calculate amplitude, period, and phase shift for graphed trigonometric functions.

- **IDENTITIES AND FUNCTIONS OF MULTIPLE ANGLES:** Student will simplify trigonometric expressions utilizing trigonometric identities, and double and half-angle formulas, and combine the identities and angle formulas learned in this unit to prove trigonometric relationships.
- **APPLICATION OF TRIGONOMETRIC FUNCTIONS:** Student will solve problems using trigonometric functions, and combine trigonometric functions and vectors to solve incline plane problems and navigation problems.
- **INVERSE TRIGONOMETRIC FUNCTIONS AND POLAR COORDINATES:** Student will solve for unknowns using inverse trigonometric functions, recognize their graphs, and convert equations from Cartesian to polar coordinates, and from polar to Cartesian coordinates.
- **QUADRATIC EQUATIONS:** Student will identify properties and equations of circles, ellipses, parabolas and hyperbolas, and calculate point rotations and apply them to equations.
- **COUNTING PRINCIPLES:** Student will distinguish between mutually exclusive, independent and dependent events, and between combination and permutation, and use the explicit formula and the recursive formula to find the n th term as well as the general term of an arithmetic sequence, or geometric sequence.
- **CALCULUS:** Student will solve functions involving numbers and conditions, understand limit notation, and evaluate limits using the limit theorems, and find the slope of curves, and calculate the angle between two curves

CURRICULUM CONTENT & SKILL FOCUS

UNIT 1: RELATIONS AND FUNCTIONS

- Identify relations between ordered pairs.
- Solve for the domain and range of ordered pairs.

- Determine if a relation is a function, find the inverse of a function, and determine whether or not the inverse is a function.
- Distinguish between linear and quadratic functions, and write their equations.
- Utilize function notation to solve for dependent variable values.
- Apply arithmetic operations to equal functions.
- Combine functions via composition, and use composition of functions to verify that two functions are inverses of each other.
- Distinguish between zero, constant and identity functions.

UNIT 2: FUNCTIONS

- Solve linear polynomials, and second degree polynomials using factoring and the quadratic equation, the remainder theorem and the factor theorem.
- Relate how a quadratic equation can define the shape and location of parabolic curves.
- Solve for the roots of quadratic inequalities, and use them to identify their graphs.
- Identify factors, upper and lower limits of Nth degree polynomials.
- Convert complex numbers from rectangular form to polar form, and from polar form to rectangular form.
- Calculate the distance between two complex numbers, find their midpoint, and graph them.
- Identify and graph exponential functions, and functions that include the Euler constant.
- Use transformations of parent functions to graph and identify key features logarithmic functions including the domain and range

UNIT 3: TRIGONOMETRIC FUNCTIONS

- Identify the trigonometric functions, and solve for missing components.
- Identify acute, right and obtuse angles, positive and negative angles in standard position.
- Reduce angles using reductions formulas.

- Determine the values of trigonometric functions at reduced and quadrantal angles.
- Calculate the values of trigonometric functions at special angles
- Understand how radians relate to degrees, and convert between radians and degrees.

UNIT 4: CIRCULAR FUNCTIONS AND THEIR GRAPHS

- Understand how the unit circle can be used to solve for components of trigonometric functions.
- Describe movement around the unit circle.
- Use reduction formulas for radian angles.
- Identify graphs of the sine, cosine, tangent, cotangent, secant and cosecant functions.
- Use parametric equations with trigonometric operations to model and solve problems.
- Calculate amplitude, period, and phase shift for graphed trigonometric functions.

UNIT 5: IDENTITIES AND FUNCTIONS OF MULTIPLE ANGLES

- Reduce trigonometric expressions.
- Simplify trigonometric expressions utilizing trigonometric identities, and double and half-angle formulas.
- Utilize cosine identities to simplify trigonometric expressions.
- Simplify expressions for adding and subtracting angles relative to the sine and tangent functions
- Derive double and half-angle formulas for cosine, sine and tangent functions
- Combine the identities and angle formulas learned in this unit to prove trigonometric relationships

UNIT 7: APPLICATION OF TRIGONOMETRIC FUNCTIONS

- Review basic trigonometric functions, and properties of right triangles.

- Combine known angles and distances to solve for right triangle unknowns.
- Relate scalars, vectors, forces and resultants.
- Solve applied resultant problems using trigonometric functions.
- Perform the mathematical operations of addition, subtraction, scalar multiplication and the dot product.
- Use the dot product to determine if two vectors are orthogonal, parallel or neither.
- Combine trigonometric functions and vectors to solve incline plane problems
- Define and utilize navigational terms to solve navigation problems

UNIT 8: INVERSE TRIGONOMETRIC FUNCTIONS AND POLAR COORDINATES

- Define the inverse of a function
- Explain how arcsin functions and square root functions are related
- Understand when the arccos function or inverse tangent is a function
- Solve for unknowns using the arccos function, or inverse tangent function
- Solve inverse trigonometric functions
- Recognize the equations, graphs and valid domains and ranges for inverse trigonometric functions
- Convert equations from Cartesian to polar coordinates, and polar coordinates to Cartesian coordinates
- Graph equations on the polar graph

UNIT 9: QUADRATIC EQUATIONS

- Distinguish between circles, hyperbolas, ellipses and parabolas
- Find the equation of a circle that passes through three given points
- Use basic algebra to determine a circle's midpoint, center and radius, and proximity to lines
- Find properties of ellipses, parabolas that are not centered at the origin, using general equations
- Identify properties of ellipses, parabolas, hyperbolas

- Write general and standard parabolic equations based on a set of givens
- Understand why points can be rotated on graphs, and equations can be translated
- Calculate point rotation, and apply the rotation to an equation

UNIT 10: COUNTING PRINCIPLES

- Combine probabilities by addition or multiplication
- Distinguish between mutually exclusive, independent and dependent events, and between combination and permutation
- Combine combinations, and probabilities including multiple conditions
- Calculate permutations involving distinct (n) different things, or where some of the items are the same things.
- Calculate circular permutations, and combinations with one variable
- Use Pascal's triangle to expand binomials, and find combinations.
- Use the explicit formula and the recursive formula to find the nth term as well as the general term of an arithmetic sequence, or geometric sequence.
- Use sigma notation to represent arithmetic series and geometric series, and to evaluate finite sums, and infinite geometric series.

UNIT 11: CALCULUS

- Recognize and utilize function notation
- Solve functions involving numbers and conditions
- Identify the difference quotient
- Understand limit notation, and evaluate limits using the limit theorems
- Understand why limits are used to find the slope of curves
- Find the slope of curves, and calculate the angle between two curves

PERFORMANCE TASKS

Each unit of study has Performance Tasks which are a part of the regular assignments for honor's courses. Students are expected to complete all sections of each Performance Tasks successfully.

REQUIRED RESOURCES

Some assignments in this course require the use of resources that must be supplied by the user. These outside resources are listed below by assignment.

PRE-CALCULUS		
Unit	Assignment Title	Supply List
All	All Assignments	Scratch Paper/Notebook Scientific Calculator Graph Paper-Coordinate and Polar

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GRADING INFORMATION

GRADING COMPONENTS

Lessons	40%
Quizzes	30%
Tests	30%

GRADING SCALE

100-90	A
89-80	B
79-70	C
69-60	D
Below 60	F