Greenwich Public Schools Curriculum Overview

PreCalculus 1 & 2

Personalized learning is achieved through standards-based, rigorous and relevant curriculum that is aligned to digital tools and resources.

Note: Teachers retain professional discretion in how the learning is presented based on the needs and interests of their students.

Course Description

Precalculus 1 - 1st semester
024505 6 Blocks 0.5 Credit
Prerequisite: C+ or better in Algebra 2A or B or better in College Algebra and Trigonometry
This first semester course of a two-semester sequence is a comprehensive study of quadratic, polynomial, rational, exponential, and logarithmic functions. Conic sections are also discussed.

Precalculus 2 - 2nd semester
024556 6 Blocks 0.5 Credit
Prerequisite: Precalculus 1 with a grade of C or better.
This second semester course of the Precalculus sequence continues the preparation for a calculus course. Topics include evaluating and analyzing trigonometric graphs, expressions and equations, law of sines and cosines, radian and degree measure, unit circle and right triangle trigonometry.

Unit Guide

Precalculus 1

- Chapter 1: Functions and their graphs
- Chapter 2: Polynomial and rational functions
- Chapter 3: Exponential and logarithmic functions
- Chapter 10: Selected topics in analytic geometry (conics)
- Semester 1 Review & Exam*

Precalculus 2

- Chapter 4: Trigonometry (Part 1)
- Chapter 4: Trigonometric Graphs (Part 2)
- Chapter 6: Additional topics in trigonometry
- Chapter 5: Analytic trigonometry
- Semester 2 Review & Exam*

**Note on Semester Exams*: Current exam review packets with answer keys, and formula sheets can be found by joining our Schoology Math Department Review Course, using COURSE access code P9V9X-H6V37.

Mathematical Practices

- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.

- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.

Enduring Understandings

Chapter 1:

- The Cartesian plane can be used to represent relationships between two variables.
- The graph of an equation can help you see relationships between real-life quantities.
- Relations and functions can be represented numerically, graphically, algebraically, and/or verbally.
- There are a set of functions, called families, in which each function is a transformation of a special function called the parent. Transformations of parent functions can be represented graphically and algebraically.
- Knowing the graphs of common functions and knowing how to shift, reflect, and stretch graphs of functions can help you sketch a wide variety of simple functions by hand.
- All functions can be affected by adding or subtracting from the function equation. This will move a function left, right, up, or down. All equations can also be affected by multiplying the equation by a constant, which will result in a stretch or compression. All functions will also be affected by negative signs which create reflections.
- Functions can be used to model and solve real-life problems.

Chapter 2:

- The degree of a polynomial and its leading coefficient will determine the shape of its graph, the maximum number of turning points, its end behavior, and the number of roots.
- All zeros of a polynomial function can be found by using division to break the function down into the product of linear and quadratic factors.
- All numbers are represented within the complex number system.
- A parent function can provide insight into a function's behavior.

Chapter 3:

- Write expressions or equations or change the form of an equation to model contexts and connect components of those expressions and equations to graphs and contexts.
- Explain that logarithmic functions are the inverse of exponential functions and have parallel properties to exponents used to rewrite expressions and solve equations.
- Know that the properties of logarithms can be used to change the form of equations to reveal solution paths.
- Use knowledge of exponents and logarithms to solve exponential modeling problems where a piece of information is missing.
- All data is not linear and many situations in economics, finance and science are represented with exponential and logarithmic curves.

Chapter 10:

- A conic is the intersection of a plane and a double napped cone
- A conic section can be classified based on its general equation

Chapter 4:

- The ratios of the side lengths of a triangle can be defined with trigonometric functions.
- The trigonometric functions of sine, cosine, tangent, cosecant, secant, and cotangent can be

used to find a missing side or angle of a right triangle.
- Periodic phenomena are modeled by transformations on the trigonometric functions of f(x) = sin(x) or f(x) = cos(x). These functions are characterized by their period, amplitude, midline, and phase shift and can be expressed algebraically in multiple ways.
- Trigonometric functions are useful in modeling periodic phenomena in the world, and trigonometric functions correspond to useful features of real-world situations.
- Trigonometry can be used not just to solve triangles, but to model waves. The important properties of waves, including amplitude, period, and shift, can be found by applying algebra to the trigonometric function. The unit circle is an important tool for finding trig values.
- The inverse trigonometric functions result from restricting the domain of the original function. They are an essential component in solving trigonometric equations.
- Periodic behavior is behavior that repeats over intervals of constant length.
- When graphing, you can translate periodic functions in the same way that you translate other functions.

Chapter 6:

- Right triangles can be solved using the definitions of sine, cosine, and tangent. If the triangle is not a right triangle, most triangles can be solved using the Law of Sines or the Law of Cosines.
- Triangles can be used to solve various real world situations.

Chapter 5:

- Identities can be used to simplify trigonometric equations and expressions.
- The trigonometric identities can be proven and are often useful when solving trigonometric equations.
- The sum, difference, double angle, and half angle formulas allow us to calculate exact values that can only be approximated with the use of a calculator.
- To solve some trigonometric equations, you can use an inverse trigonometric function to find one solution, and then use periodicity to find all solutions.

Essential Questions:

Chapter 1:

- What is the domain and range of a function?
- How does the equation of a function affect its graphical representation?
- How does changing the equation of a function in more than one way affect its graphical representation?
- What happens to a parent function when you transform its graph?
- How can I use the equation of a function to graph the function without using ordered pairs?
- Why are relations and functions represented in multiple ways?
- How are properties of functions and functional operations useful?
- What makes a function even or odd?
- What determines continuity and how can you find and describe discontinuities?

Chapter 2:

- What is a quadratic function?
- What properties / characteristics of quadratic functions are necessary in order to analyze and graph?
- What are the advantages / disadvantages in having a quadratic function written in standard form? Vertex form? Intercept form?
- How does factoring assist in finding the zeros (roots / intercepts) of a quadratic function?
- How can we solve equations with complex and real roots?
- What strategies do we have for identifying real and complex roots?

- How can you find all of the zeros of a polynomial function?
- How can you write a polynomial function given its zeros?
- What makes an accurate sketch of a polynomial function?
- How can a polynomial function model real world applications and assist in drawing conclusions?
- Why do rational equations sometimes have extraneous solutions?

Chapter 3:

- How are exponential functions and logarithmic functions related?
- How do you use the properties of logarithms to rewrite expressions?
- How do you solve exponential and logarithmic equations?
- What real-world phenomena are modeled by exponential or logarithmic functions?
- How is continuously compounded interest different from compound interest?

Chapter 10:

- How do I identify and apply the characteristics of the conic sections?
- How do I identify the characteristics of circles from equations?
- What characteristics of circles are necessary to graph and write the equations of circles?
- How do I identify characteristics of parabolas, ellipses and hyperbolas graphically and algebraically centered or not centered on the origin?

Chapter 4:

- What is the relationship between degree and radian measurement?
- How do the trigonometric ratios relate to the right triangle?
- How can you use the angle of elevation and angle of depression with trigonometric ratios?
- What is a radian measure, and how can we draw angles on a coordinate plane?
- How can you find trig ratios of general angles without your calculator?
- What is the purpose of measuring angles in radians?
- What does evaluating a trig function at a given angle mean in real life?
- How does changing the size of a right triangle affect the sine, cosine and tangent of its angles?
- How do you use right triangles to solve real world problems?
- How do we graph sine, cosine, tangent, cotangent, secant, and cosecant functions?
- How do trigonometric functions help to model periodic phenomena?
- How can sinusoids be used to model real-world phenomena like tides, the motion of a roller coaster, the motion of a piston, etc.?
- What are the major attributes of the graphs of the six trigonometric functions?
- Why are some trigonometric functions continuous and some not continuous?
- Why is it important to restrict the domain of a trigonometric function when determining its inverse?

Chapter 6:

- How do you find the missing information from a given triangle?
- How do you use triangles to solve real world problems?
- How can the Law of Sines and Law of Cosines be used to solve non-right triangles?
- Why can some triangles be solved and others cannot? And why are there multiple solutions to others?
- How can Heron's Formula be used to find the area of a triangle?

Chapter 5:

- What are the fundamental identities of trigonometry and how are they found?
- How are the fundamental identities used to simplify trigonometric expressions?
- How can you verify a trigonometric identity?

- How can trigonometric identities be used to solve equations?
- What are the double-angle identities and their purpose?
- What are the half-angle identities and their purpose?

Resources and Assured Experiences

Textbook Information for both Precalculus 1 & 2:

Precalculus with Limits
Larson /Hosteler
Houghton Mifflin (2007)
ISBN 0-618-66090-9

GHS Capstone Task:

Vision of the Graduate #3 - Explore, define, and solve complex problems
Cardiac Stress Test - to complete after Chapter 3: Exponential & Logarithmic Functions

Quarterly Grading

Quarter Grades will be determined using the following components:

- Participation (includes Classwork) = 10%
- Preparation (includes Homework) = 10%
- Assessments (both Summative & Formative) = 80%

Connecticut Common Core State Standards

- Chapter 1: CCSS.MATH.CONTENT.HSF.IF.A.1, A.2, B.4, B.6; HSF.BF.B.3, B.4, B.4.B, B.4.C
- Chapter 2: CCSS.MATH.CONTENT.HSF.IF.B.4, C.7, C.7.A,C.7.C, C.7.D; HSF.BF.B.3; HSA.APR.B.2, B.3, D.6; HSA.REI.A.2; HSN.CN.A.1, A.2, C.7, C.8, C.9.
- Chapter 3: CCSS.MATH.CONTENT.HSF.IF.C.7.E, C.8.B; HSF.BF.B.3, B.5; HSF.LE.A.1.C, A.2, LE.A.4, B.5
- Chapter 10: CCSS.MATH.CONTENT.HSG.GPE.A.2, A.3
- Chapter 4: CCSS.MATH.CONTENT.HSF.TF.A.1, A.2, A.3, A.4, B.5, B.6, B.7; HSG.SRT.C.6, C.8; HSF.IF.C.7, C.7.E
- Chapter 6: CCSS.MATH.CONTENT.HSG.GPE.B.7; HSG.SRT.D.10; D.11.
- Chapter 5: CCSS.MATH.CONTENT.HSF.TF.C.8, C.9.