Course Resources:

Precalculus - Course Syllabus

Excel HIGH SCHOOL

Precalculus - Course Syllabus

Description:

Exploring the relationship between advanced algebra topics and trigonometry, Pre-Calculus is an informative introduction to calculus that challenges students to discover and comprehend the nature of graphs, nonlinear systems, and polynomial and rational functions. Encouraging logarithmic knowledge and application, this course covers many interesting and advanced subject areas in a thoughtful and supportive format, providing students a deeper understanding of topics, including limits, continuity, derivatives, and the Fundamental Theorem of Calculus.

Textbook: Precalculus ISBN-10 1938168348 ISBN-13 978-1-938168-34-5

Course objectives:

Throughout the course, you will meet the following goals:

Extend on previous coursework with functions with a more in-depth analysis of polynomial and transcendental functions.
Use matrices and vectors to solve mathematical and real-world problems.
Use parametric equations to describe functions and model real-world concepts.
Analyze conic sections and their rotations in Cartesian and polar coordinate systems.
Perform statistical analysis using normal distribution approximations.
Understand the concepts of a limit, a derivative, and an integral and how they are related via the Fundamental Theorem of Calculus.

Contents:

Semester A

Chapter 1: Functions
Chapter 2: Linear Functions
Chapter 3: Polynomial and Rational Functions
Chapter 4: Exponential and Logarithmic Functions
Chapter 5: Trigonometric Functions
Chapter 6: Periodic Functions

Semester B

Chapter 7: Trigonometric Identities and Equations
Chapter 8: Further Applications of Trigonometry
Chapter 9: Systems of Equations and Inequalities
Chapter 10: Analytic Geometry
Chapter 11: Sequences, Probability and Counting Theory
Chapter 12: Introduction to Calculus

Grading Scale	Grade Weighting
A = 90-100%	**Chapter Quizzes..... 70%**
B = 80-89%	**Cumulative Exam..... 30%**
C = 70-79%	**100%**
D = 60-69%	
F = under 59%	

calculator: https://www.desmos.com/calculator
geometry shape creator: https://www.desmos.com/geometry

Unit	Essential Questions	Learning Objectives	Instructional Strategies	Resources	Assessments
Months 1-12					

Module 1: Functions *(updated 3/10/21)*	: How do patterns and functions help us describe data and physical phenomena and solve a variety of problems?	Students will: Determine whether a relation represents a function Find the value of a function Determine if a function in one-to-one Apply vertical line test Graph functions Find domain of a function Graph piecewise-defined functions Find average rate of change of a function From a graph: determine increase, decrease, constant; locate local maxima/minima, locate absolute maximum/minimum Combine functions, create new functions, evaluation composite functions Identify domain of composite functions Decompose a composite function Graph functions using: vertical and horizontal shifts; reflections about the x and y axis; compressions and sketches Use graph to determine odd, even or neither function Combine transformations Graph absolute value function/equation Solve absolute value inequality Verify, find, or identify inverse functions Determine domain and range of inverse functions	direct instruction - textbook direct instruction - interactive video guided practice independent practice	Chapter 1 Introduction 1.1 Functions and Function Notation 1.2 Domain and Range 1.3 Rates of Change and Behavior of Graphs 1.4 Transformation of Functions 1.6 Absolute Value Functions 1.7 Inverse Functions Chapter 1 Review	Chapter 1 Quiz
Unit	**Essential Questions**	**Learning Objectives**	**Instructional Strategies**	**Resources**	**Assessments**
Months 1-12					
Module 2: Linear Functions *(updated 3/10/21)*	How do geometric relationships and measurements help us to solve problems and make sense of our world?	Students will: Represent a linear function. Determine whether a linear function is increasing, decreasing, or constant. Calculate and interpret slope. Write the point-slope form of an equation. Write and interpret a linear function. Graph linear functions. Write the equation for a linear function from the graph of a line. Given the equations of two lines, determine whether their graphs are parallel or perpendicular. Write the equation of a line parallel or perpendicular to a given line. Solve a system of linear equations. Identify steps for modeling and solving. Build linear models from verbal descriptions. Build systems of linear models. Draw and interpret scatter plots. Find the line of best fit. Distinguish between linear and nonlinear relations. Use a linear model to make predictions.	direct instruction - textbook direct instruction - interactive video guided practice independent practice	Chapter 2 Introduction 2.1 Linear Functions 2.2 Graphs of Linear Functions 2.3 Modeling with Linear Functions 2.4 Fitting Linear Models to Data Chapter 2 Review	Chapter 2 Quiz
Unit	**Essential Questions**	**Learning Objectives**	**Instructional Strategies**	**Resources**	**Assessments**
Months 1-12					

Module 3: Polynomial and Rational Functions *(updated 3/10/21)*	How do numbers represent quantitative relationships?	Students will: Express square roots of negative numbers as multiples of i Plot complex numbers on the complex plane. Add and subtract complex numbers. Multiply and divide complex numbers. Recognize characteristics of parabolas. Understand how the graph of a parabola is related to its quadratic function. Determine a quadratic function's minimum or maximum value. Solve problems involving a quadratic function's minimum or maximum value. Identify power functions. Identify end behavior of power functions. Identify polynomial functions. Identify the degree and leading coefficient of polynomial functions. Recognize characteristics of graphs of polynomial functions. Use factoring to find zeros of polynomial functions. Identify zeros and their multiplicities. Determine end behavior. Understand the relationship between degree and turning points. Graph polynomial functions. Use the Intermediate Value Theorem. Use long division to divide polynomials. Use synthetic division to divide polynomials. Evaluate a polynomial using the Remainder Theorem. Use the Factor Theorem to solve a polynomial equation. Use the Rational Zero Theorem to find rational zeros. Find zeros of a polynomial function. Use the Linear Factorization Theorem to find polynomials with given zeros. Use Decartes' Rule of Signs. Solve real-world applications of polynomial equations. Use arrow notation. • Solve applied problems involving rational functions. Find the domains of rational functions. Identify vertical asymptotes. Identify horizontal asymptotes. Graph rational functions. Find the inverse of a polynomial function. Restrict the domain to find the inverse of a polynomial function. Solve direct variation problems. Solve inverse variation problems. Solve problems involving joint variation.	direct instruction - textbook direct instruction - interactive video guided practice independent practice	Chapter 3 Introduction 3.1 Complex Numbers 3.2 Quadratic Functions 3.3 Power Functions and Polynomial Functions 3.4 Graphs of Polynomial Functions 3.5 Dividing Polynomials 3.6 Zeros of Polynomial Functions 3.7 Rational Functions 3.8 Inverses and Radical Functions 3.9 Modeling Using Variation Chapter 3 Review 3.9	Chapter 3 Quiz
Unit	**Essential Questions**	**Learning Objectives**	**Instructional Strategies**	**Resources**	**Assessments**
Months 1-12					

Module 4: Exponential and Logarithmic Functions *(updated 3/10/21)*	How are exponential and logarithmic functions related?	Students will: Evaluate exponential functions. Find the equation of an exponential function. Use compound interest formulas. Evaluate exponential functions with base e Graph exponential functions. Graph exponential functions using transformations. Convert from logarithmic to exponential form. Convert from exponential to logarithmic form. Evaluate logarithms. Use common logarithms. Use natural logarithms. dentify the domain of a logarithmic function. Graph logarithmic functions. Use the product rule for logarithms. Use the quotient rule for logarithms. Use the power rule for logarithms. Expand logarithmic expressions. Condense logarithmic expressions. Use the change-of-base formula for logarithms. Use like bases to solve exponential equations. Use logarithms to solve exponential equations. Use the definition of a logarithm to solve logarithmic equations. Use the one-to-one property of logarithms to solve logarithmic equations. Solve applied problems involving exponential and logarithmic equations. Use like bases to solve exponential equations. Use logarithms to solve exponential equations. Use the definition of a logarithm to solve logarithmic equations. Use the one-to-one property of logarithms to solve logarithmic equations. Solve applied problems involving exponential and logarithmic equations. Build an exponential model from data. Build a logarithmic model from data. Build a logistic model from data.	direct instruction - textbook direct instruction - interactive video guided practice independent practice	Chapter 4 Introduction 4.1 Exponential Functions 4.2 Graphs of Exponential Functions 4.3 Logarithmic Functions 4.4 Graphs of Logarithmic Functions 4.5 Logarithmic Properties 4.6 Exponential and Logarithmic Equations 4.7 Exponential and Logarithmic Models 4.8 Fitting Exponential Models to Data Chapter 4 Review	Chapter 4 Quiz
Unit	**Essential Questions**	**Learning Objectives**	**Instructional Strategies**	**Resources**	**Assessments**
Months 1-12					
Module 5: Trigonometric Functions *(updated 3/10/21)*	Where can the graphs of trigonometric functions be found in our every day lives?	Students will: Draw angles in standard position. Convert between degrees and radians. Find coterminal angles. Find the length of a circular arc. Use linear and angular speed to describe motion on a circular path. Find function values for the sine and cosine of Identify the domain and range of sine and cosine functions. Use reference angles to evaluate trigonometric functions. Find exact values of the trigonometric functions secant, cosecant, tangent, and cotangent Use reference angles to evaluate the trigonometric functions secant, cosecant, tangent, and cotangent. Use properties of even and odd trigonometric functions. Recognize and use fundamental identities.	direct instruction - textbook direct instruction - interactive video guided practice independent practice	Chapter 5 Introduction 5.1 Angles 5.2 Unit Circle: Sine and Cosine Functions 5.3 The Other Trigonometric Functions 5.4 Right Triangle Trigonometry Chapter 5 Review	Chapter 5 Quiz

		Evaluate trigonometric functions with a calculator. Use right triangles to evaluate trigonometric functions. Find function values for \(30°_6, 45°_4, and 60°_3\) Use cofunctions of complementary angles. Use the definitions of trigonometric functions of any angle. Use right triangle trigonometry to solve applied problems.			
Unit	**Essential Questions**	**Learning Objectives**	**Instructional Strategies**	**Resources**	**Assessments**
Months 1-12					
Module 6: Periodic Functions *(updated 3/26/20)*		Students will: Graph variations of y=sin(x) and y=cos(x) .Use phase shifts of sine and cosine curves. Analyze the graph of y=tan x Graph variations of y =tan x Analyze the graphs of y=sec x and y=csc x Graph variations of y = sec x and y=csc x Analyze the graph of y=cot x Graph variations of y=co t x Understand and use the inverse sine, cosine, and tangent functions. Find the exact value of expressions involving the inverse sine, cosine, and tangent functions. Use a calculator to evaluate inverse trigonometric functions. Find exact values of composite functions with inverse trigonometric functions.	direct instruction - textbook direct instruction - interactive video guided practice independent practice	Chapter 6 Introduction 6.1 Graphs of the Sine and Cosine Functions 6.2 Graphs of the Other Trigonometric Functions 6.3 Inverse Trigonometric Functions Chapter 6 Review	Chapter 6 Quiz
Unit	**Essential Questions**	**Learning Objectives**	**Instructional Strategies**	**Resources**	**Assessments**
Months 1-12					
Module 7: Trigonometric Identities and Equations *(updated 3/26/20)*		Students will: Verify the fundamental trigonometric identities. Simplify trigonometric expressions using algebra and the identities. Use sum and difference formulas for cosine. Use sum and difference formulas for sine. Use sum and difference formulas for tangent. Use sum and difference formulas for cofunctions. Use sum and difference formulas to verify identities. Use double-angle formulas to find exact values. Use double-angle formulas to verify identities. Use reduction formulas to simplify an expression. Use half-angle formulas to find exact values. Express products as sums. Express sums as products. Solve linear trigonometric equations in sine and cosine. Solve equations involving a single trigonometric function. Solve trigonometric equations using a calculator. Solve trigonometric equations that are quadratic in form. Solve trigonometric equations using fundamental identities. Solve trigonometric equations with multiple angles. Solve right triangle problems.	direct instruction - textbook direct instruction - interactive video guided practice independent practice	Chapter 7 Introduction 7.1 Solving Trigonometric Equations with Identities 7.2 Sum and Difference Identities 7.3 Double-Angle, Half-Angle, and Reduction Formulas 7.4 Sum-to Product and Product-to-Sum Formulas 7.5 Solving Trigonometric Equations 7.6 Modeling with Trigonometric Equations Chapter 7 Review	Chapter 7 Quiz

		Determine the amplitude and period of sinusoidal functions. Model equations and graph sinusoidal functions. Model periodic behavior. Model harmonic motion functions.			
Unit	**Essential Questions**	**Learning Objectives**	**Instructional Strategies**	**Resources**	**Assessments**
Months 1-12					
Module 8: Further Applications of Trigonometry *(updated 3/26/20)*		Students will: Use the Law of Sines to solve oblique triangles. Find the area of an oblique triangle using the sine function. Solve applied problems using the Law of Sines. Use the Law of Cosines to solve oblique triangles. Solve applied problems using the Law of Cosines. Use Heron's formula to find the area of a triangle. Plot points using polar coordinates. Convert from polar coordinates to rectangular coordinates. Convert from rectangular coordinates to polar coordinates. Transform equations between polar and rectangular forms. Identify and graph polar equations by converting to rectangular equations. est polar equations for symmetry. Graph polar equations by plotting points. Plot complex numbers in the complex plane. Find the absolute value of a complex number. Write complex numbers in polar form. Convert a complex number from polar to rectangular form. Find products of complex numbers in polar form. Find quotients of complex numbers in polar form. Find powers of complex numbers in polar form. Find roots of complex numbers in polar form. Parameterize a curve. Eliminate the parameter. Find a rectangular equation for a curve defined parametrically. Find parametric equations for curves defined by rectangular equations. Graph plane curves described by parametric equations by plotting points. Graph parametric equations. View vectors geometrically. Find magnitude and direction. Perform vector addition and scalar multiplication. Find the component form of a vector. Find the unit vector in the direction of v Perform operations with vectors in terms of i and j Find the dot product of two vectors.	direct instruction - textbook direct instruction - interactive video guided practice independent practice	Chapter 8 Introduction 8.1 Non-right Triangles: Law of Sines 8.2 Non-right Triangles: Law of Cosines 8.3 Polar Coordinates 8.4 Polar Coordinates: Graphs 8.5 Polar Form of Complex Numbers 8.6 Parametric Equations 8.7 Parametric Equations: Graphs 8.8 Vectors Chapter 8 Review	Chapter 8 Quiz
Unit	**Essential Questions**	**Learning Objectives**	**Instructional Strategies**	**Resources**	**Assessments**
Months 1-12					

Module 9: Systems of Equations and Inequalities *(updated 3/26/20)*		Students will: View vectors geometrically. Find magnitude and direction. Perform vector addition and scalar multiplication. Find the component form of a vector. Find the unit vector in the direction of v Solve systems of three equations in three variables. Identify inconsistent systems of equations containing three variables. Express the solution of a system of dependent equations containing three variables. Perform operations with vectors in terms of i and j Find the dot product of two vectors. Solve systems of three equations in three variables. Identify inconsistent systems of equations containing three variables. Express the solution of a system of dependent equations containing three variables. Solve a system of nonlinear equations using substitution. Solve a system of nonlinear equations using elimination. Graph a nonlinear inequality. Graph a system of nonlinear inequalities. Decompose P(x)Q(x), where Q(x) has: only nonrepeated linear factors; repeated linear factors; a nonrepeated irreducible quadratic factor: a repeated irreducible quadratic factor. Find the sum and difference of two matrices. Find scalar multiples of a matrix. Find the product of two matrices. Write the augmented matrix of a system of equations. •Write the system of equations from an augmented matrix. Perform row operations on a matrix. Solve a system of linear equations using matrices. Find the inverse of a matrix. Solve a system of linear equations using an inverse matrix. Evaluate 2 × 2 determinants. Use Cramer's Rule to solve a system of equations in two variables. Evaluate 3 × 3 determinants. Use Cramer's Rule to solve a system of three equations in three variables. Know the properties of determinants.	direct instruction - textbook direct instruction - interactive video guided practice independent practice	Chapter 9 Introduction 9.1 Systems of Linear Equations: Two Variables 9.2 Systems of Linear Equations: Three Variables 9.3 Systems of Nonlinear Equations and Inequalities: Two Variables 9.4 Partial Fractions 9.5 Matrices and Matrix Operations 9.6 Solving Systems with Gaussian Elimination 9.7 Solving Systems with Inverses 9.8 Solving Systems with Cramer's Rule Chapter 9 Review	Chapter 9 Quiz
Unit	**Essential Questions**	**Learning Objectives**	**Instructional Strategies**	**Resources**	**Assessments**
Months 1-12					
Module 10: Analytic Geometry *(updated 3/26/20)*		Students will: Write equations of ellipses in standard form. Graph ellipses centered at the origin. Graph ellipses not centered at the origin. Solve applied problems involving ellipses. Locate a hyperbola's vertices and foci. Write equations of hyperbolas in standard form. Graph hyperbolas centered at the origin. Graph hyperbolas not centered at the origin. Solve applied problems involving hyperbolas.	direct instruction - textbook direct instruction - interactive video guided practice independent practice	Chapter 10 Introduction 10.1 The Ellipse 10.2 The Hyperbola 10.3 The Parabola 10.4 Rotation of Axis 10.5 Conic Sections in Polar Coordinates Chapter 10 Review	Chapter 10 Quiz

		Graph parabolas with vertices at the origin. Write equations of parabolas in standard form. Graph parabolas with vertices not at the origin. Solve applied problems involving parabolas. Identify nondegenerate conic sections given their general form equations. Use rotation of axes formulas. Write equations of rotated conics in standard form. Identify conics without rotating axes. Identify a conic in polar form. Graph the polar equations of conics. Define conics in terms of a focus and a directrix.			
Unit	**Essential Questions**	**Learning Objectives**	**Instructional Strategies**	**Resources**	**Assessments**
Months 1-12					
Module 11: Sequences, Probability and Counting Theory *(updated 3/10/21)*	How is a numerical pattern evaluated to develop a sequence?	Students will: Write the terms of a sequence defined by an explicit formula. Write the terms of a sequence defined by a recursive formula. Use factorial notation. Find the common difference for an arithmetic sequence. Write terms of an arithmetic sequence. Use a recursive formula for an arithmetic sequence. Use an explicit formula for an arithmetic sequence. Find the common ratio for a geometric sequence. List the terms of a geometric sequence. Use a recursive formula for a geometric sequence. Use an explicit formula for a geometric sequence. Use summation notation. Use the formula for the sum of the first *n* terms of an arithmetic series. Use the formula for the sum of the first *n* terms of a geometric series. Use the formula for the sum of an infinite geometric series. Solve annuity problems. Solve counting problems using the Addition Principle. Solve counting problems using the Multiplication Principle. Solve counting problems using permutations involving *n* distinct objects. Solve counting problems using combinations. Find the number of subsets of a given set. Solve counting problems using permutations involving n non-distinct objects. Apply the Binomial Theorem. Compute probabilities of equally likely outcomes. Compute probabilities of the union of two events. Use the complement rule to find probabilities. Compute probability using counting theory.	direct instruction - textbook direct instruction - interactive video guided practice independent practice	Chapter 11 Introduction 11.1 Sequences and Their Notations 11.2 Arithmetic Sequence 11.3 Geometric Sequences 11.4 Series and Their Notations 11.5 Counting Principles 11.6 Binomial Theorem 11.7 Probability Chapter 11 Review	Chapter 11 Quiz
Unit	**Essential Questions**	**Learning Objectives**	**Instructional Strategies**	**Resources**	**Assessments**
Months 1-12					

Module 12: Introduction to Calculus, Months 1-12 *(updated 3/26/20)*		Students will: Understand limit notation. Find a limit using a graph. Find a limit using a table. Find the limit of a sum, a difference, and a product. Find the limit of a polynomial. Find the limit of a power or a root. Find the limit of a quotient. Determine whether a function is continuous at a number. Determine the numbers for which a function is discontinuous. Determine whether a function is continuous. Find the derivative of a function. Find instantaneous rates of change. Find an equation of the tangent line to the graph of a function at a point. Find the instantaneous velocity of a particle.	direct instruction - textbook direct instruction - interactive video guided practice independent practice	Chapter 12 Introduction 12.1 Finding Limits: Numerical and Graphical Approaches 12.2 Finding Limits: Properties of Limits 12.3 Continuity 12.4 Derivatives Chapter 12 Review	Chapter 12 Quiz