Homewood-Flossmoor Community High School
District 233
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Course Syllabus

Course Name: Principles of Pre-Calculus
Course Number: 3235
Level: College Prep
Department: Mathematics

Course Description

Prerequisite: 2 semesters of Algebra 2/Trig CP
Open to: Jr., Sr.
Length: Year
Credit: 1

Summary:
This course is designed for students who would like to strengthen their Algebra II and Trigonometry knowledge base before enrolling in a college course. Topics include functions (linear, quadratic, absolute value, sqauare root, and cubic) and their graphs, trigonometric functions, polynomial functions, rational functions, mathematical inductions, arithmetic sequences and series, and geometric sequences and series.

A graphing calculator is required: TI-83, TI-83+, TI-84, or TI-84+.

Course Goals:

Chapter 1 Functions and Graphs

1.2 Basics of Functions and Their Graphs

Students will….

- be able to find the domain and range of a relation.
- be able to determine whether or not a relation is a function.
- be able to determine whether an equation represents a function.
- be able to evaluate a function
- be able to graph functions by plotting points.
- be able to use the vertical line test to identify functions.
- be able to identify the domain and range of a function from its graph.
- be able to identify intercepts from a function's graph.

1.3 More on Function and Their Graphs

Students will….

- be able to find and simplify a function's difference quotient.
- be able to graph piece-wise functions.

- be able to identify intervals on which a function increases, decreases, or is constant.
- be able to use the graph to locate relative maxima or minima.
- be able to identify even or odd functions and recognize their symmetries.
- be able to graph step functions.

1.7 Combinations of Functions; Composite Functions
Students will….

- Find the domain of a function.
- Combine Functions using algebra of functions, specifying domains.
- Form composite functions.
- Determine domains for composite functions.
- Write functions as compositions.

1.2 Basics of Functions and Their Graphs
Students will….

- be able to verify inverse functions.
- be able to find the inverse of a function.
- be able to use the horizontal line test to determine if a function has an inverse function.
- be able to use the graph of a one-to-one function to graph its inverse function.
- be able to find the inverse of a function and graph both functions on the same axes.

Chapter 2A Basics of Functions and Their Graphs
2.1 Complex Numbers
Students will….

- be able to add, subtract, multiply and divide complex numbers.
- be able to perform operations with square roots of negative numbers.
- be able to solve quadratic equations with complex imaginary solutions.

2.2. Quadratic Functions
Students will….

- be able to recognize characteristics of parabolas.
- be able to graph parabolas.
- be able to determine a quadratic function’s minimum or maximum value.
- be able to solve problems involving a quadratic function’s minimum or maximum value.

2.3 Polynomial Functions and Their Graphs
Students will….

- be able to identify polynomial functions.
- be able to recognize characteristics of graphs of polynomial functions.
- be able to determine the end behavior of graphs.
- be able to use factoring to find zeros of polynomial functions.
- be able to identify zeros and their multiplicities.
- be able to use the Intermediate Value Theorem.
- be able to understand the relationship between degree and turning points.
- be able to graph polynomial functions.

2.4 Dividing Polynomials; Remainder and Factor Theorems
Students will….

- be able to use long division to divide polynomials.
- be able to use synthetic division to divide polynomials.
- be able to evaluate a polynomial using the Remainder Theorem.
- be able to solve a polynomial equation using the Factor Theorem.

2.5 Zeros of Polynomial Functions
Students will….

- be able to use the Rational Zero Theorem to find possible rational zeros.
- be able to find the zeros of a polynomial function.
- be able to solve polynomial equations.
- be able to find polynomials with given zeros using the Linear Factorization Theorem.
- be able to apply Descartes's Rule of Signs.

Chapter 2B Basics of Functions and Their Graphs (Continued)
2.6 Rational Functions and Their Graphs
Students will….

- be able to find the domain of rational functions.
- be able to use arrow notation.
- be able to identify vertical asymptotes.
- be able to identify horizontal asymptotes.
- be able to use transformations to graph rational expressions.
- be able to graph rational functions.
- be able to identify slant asymptotes.
- be able to solve applied problems involving rational functions.

2.7 Polynomial and Rational Inequalities
Students will….

- be able to solve polynomial inequalities.
- be able to solve rational inequalities.
- be able to solve application problems involving polynomials or polynomial inequalities.

Chapter 3 Exponential and Logarithmic Functions
3.1 Exponential Functions
Students will….

- be able to evaluate exponential functions.
- be able to graph exponential functions.
- be able to evaluate functions with base *e.*
- be able to use compound interest formulas.

3.2 Logarithmic Functions
Students will….

- be able to change from logarithmic to exponential.
- be able to change from exponential to logarithmic form.
- be able to evaluate logarithms.
- be able to apply logarithmic properties.
- be able to graph logarithmic functions.
- be able to find the domain of a logarithmic function.
- be able to use common logarithms.

- be able to use natural logarithms.

Chapter 9 Conic Sections and Analytic Geometry
9.1 The Ellipse
Students will….

- be able to graph ellipses centered at the origin.
- be able to write equations of ellipses in standard form.
- be able to graph ellipses not centered at the origin.
- be able to solve applied problems involving ellipses.

9.2 The Hyperbola
Students will….

- be able to locate the hyperbola's vertices and foci.
- be able to write equations of hyperbolas in standard form.
- be able to graph hyperbolas centered at the origin.
- be able to graph hyperbolas not centered at the origin.
- be able to solve applied problems involving hyperbolas.

Chapter 7 Systems of Equations & Inequalities
7.1 Systems of Linear Equations in Two Variables
Students will….

- be able to decide whether an ordered pair is a solution of a linear system.
- be able to solve linear systems by substitution.
- be able to solve linear systems by addition.
- be able to identify systems that do not have exactly one solution.
- be able to solve application problems using systems of linear equations.

7.2 Systems of Nonlinear Equations in Two Variables
Students will….

- be able to recognize systems of nonlinear equations in two variables.
- be able to solve nonlinear systems by substitution.
- be able to solve nonlinear systems by addition.
- be able to solve problems using systems of nonlinear equations.

Chapter 4A Trigonometric Functions
4.1 Angles and Radian Measures
Students will…

- be able to recognize and use the vocabulary of angles.
- be able to use degree measure.
- be able to use radian measure.
- be able to convert between degrees and radian measures.
- be able to draw angles in standard position.
- be able to calculate coterminal angles.
- be able to find the length of a circular arc.
- be able to use linear and angular speed to describe motion on a circular path.

4.2 Trigonometric functions: The Unit Circle
Students will…

- be able to use a unit circle to define trigonometric functions of real numbers.
- be able to recognize the domain and range of sine and cosine functions.
- be able to find exact values of trigonometric functions at $\frac{\pi}{4}$.
- be able to use even and odd trigonometric functions.
- be able to recognize and use fundamental identities.
- be able to use periodic properties.
- be able to evaluate trigonometric functions with a calculator.

4.3 Right Triangle Trigonometry
Students will…

- be able to use right triangles to evaluate trigonometric functions.
- be able to find the function values for $30^\circ\ \left(\frac{\pi}{6}\right), 45^\circ\ \left(\frac{\pi}{4}\right), and\ 60^\circ\ \left(\frac{\pi}{3}\right)$.
- be able to use equal co-functions of complements.
- be able to use right triangle trigonometry to solve applied problems.

4.4 Trigonometric Functions of Any Angle
Students will…

- be able to use the definitions of trigonometric functions for any angle.
- be able to use the signs of trigonometric functions.
- be able to find reference angles.
- be able to evaluate trigonometric functions using reference angles.

4.8 Applications of Trigonometric Functions
Students will…

- be able to solve a right triangle.
- be able to solve problems involving bearings.
- be able to model simple harmonic motion.

Chapter 4B Trigonometric Functions
4.5 Graphs of Sine and Cosine Functions
Students will…

- be able to understand the graph of y= sin x .
- be able to graph the variations of y = sin x.
- be able to understand the graph of y = cos x.
- be able to graph the variations of y = cos x.
- be able to utilize vertical shifts of sine and cosine curves.
- be able to model periodic behavior.

4.6 Graphs of other Trigonometric Functions
Students will…

- be able to understand the graph of y = tan x.
- be able to graph variations of y = tan x.
- be able to understand the graph of y = cot x.
- be able to graph variations of y = cot x.
- be able to understand the graphs of y = csc x and y = sec x.

- be able to graph variations of y = csc x and y = sec x.

4.7 Inverse of Trigonometric Functions

Students will…

- be able to understand and use the inverse sine function.
- be able to understand and use the inverse cosine function.
- be able to understand and use the inverse tangent function.
- be able to use a calculator to evaluate the inverse trigonometric functions.
- be able to find exact values of composite functions with inverse trigonometric functions.

Chapter 5 Analytical Trigonometry

5.1 Verifying Trigonometric Identities

Students will…

- be able to use fundamental trigonometric identities to verify identities.

5.2 Sum and Difference Formulas

Students will…

- be able to use the formula for the cosine of the difference of two angles.
- be able to use the sum and difference formula for cosine and sine.
- be able to use the sum and difference formulas for tangents.

5.5 Trigonometric Equations

Students will…

- b able to find all the solutions of a trigonometric equation.
- be able to solve equations with multiple angles.
- be able to solve equations in quadratic form.
- be able to use factoring to separate different functions in trigonometric equations.
- be able to use identities to solve trigonometric equations.
- be able to use a calculator to solve trigonometric equation.

Chapter 6 Additional Topics in Trigonometry

6.1 The Law of Sines

Students will…

- be able to use the Law of Sines to solve oblique triangles.
- be able to use the Law of Sines to solve triangles in ambiguous cases (if possible).
- be able to find the area of an oblique triangle using the sine function.
- be able to solve applied problems using the Law of Sines.

6.2 The Law of Cosines

Students will…

- be able to use the Law of Cosines to solve oblique triangles.
- be able to solve applied problems using the Law of Cosines.
- be able to use Heron's formula to find the area of a triangle.

Chapter 10 Sequences, Induction, and Probability

10.1 Sequence and Summation Notation

Students will…

- be able to find particular terms of a sequence from the general term.

- be able to utilize the recursion formulas.
- be able to use factorial notation.
- be able to use summation notation.

10.2 Arithmetic Sequences
Students will…

- be able to find the common difference for an arithmetic sequence.
- be able to write the terms of an arithmetic sequence.
- be able to use the formula for the general term of an arithmetic sequence.
- be able to use the formula for the sum of the first *n* terms of an arithmetic sequence.

10.3 Geometric Sequences and Series
Students will…

- be able to find the common ratio of a geometric sequence.
- be able to write the terms of a geometric sequence.
- be able to use the formula for the general term of a geometric sequence.
- be able to use the formula for the first *n* terms of a geometric sequence.
- be able to find the value of an annuity.
- be able to use the formula for the sum of an infinite geometric series.

10.5 The Binomial Theorem
Students will…

- be able to evaluate a binomial coefficient.
- be able to expand a binomial raised to a power.
- be able to find a particular term in a binomial expansion.

10.6 Counting Principles, Permutations, and Combinations
Students will…

- be able to use the Fundamental Counting Principle.
- be able to use the permutation formula.
- be able to distinguish between permutation problems and combination problems.
- be able to use the combination formula.

10.7 Probability
Students will…

- be able to compute empirical probability.
- be able to compute theoretical probability.
- be able to find the probability that an event will not occur.
- be able to find the probability that one event **or** a second event will occur.
- be able to find the probability that one event **and** a second event will occur.

College Entrance Exam Prep
Section 1.2
Students will…

- be able to find the domain and range of a relation.
- be able to determine whether or not a relation is a function.
- be able to determine whether an equation represents a function.
- be able to evaluate a function
- be able to graph functions by plotting points.

- be able to use the vertical line test to identify functions.
- be able to identify the domain and range of a function from its graph.
- be able to identify intercepts from a function's graph

1.3 More on Function and Their Graphs
Students will…

- be able to graph piece-wise functions.
- be able to identify intervals on which a function increases, decreases, or is constant.
- be able to use the graph to locate relative maxima or minima.
- be able to identify even or odd functions and recognize their symmetries.

P.2 Exponents and Scientific Notation
Students will…

- be able to apply the Laws of Exponents
- be able to express scientific notation numbers in standard form.
- be able to express standard form numbers in scientific notation.

2.1 Complex Numbers
Students will…

- be able to add, subtract, multiply and divide complex numbers.
- be able to perform operations with square roots of negative numbers.
- be able to solve quadratic equations with complex imaginary solutions.

8.1 Matrices and Determinants
Students will…

- be able to write the augmented matrix for a linear system.
- be able to use matrices to solve systems of equations.

8.3 Matrix Operations and Their Applications
Students will…

- be able to add, subtract and multiply matrices.
- be able to perform scalar multiplication.

8.5 Determinants & Cramer's Rule
Students will…

- be able to evaluate a second-order determinant.

Fractions, Decimals, and Percents
Students will…

- be able to add, subtract, multiply and divide rational numbers.
- be able to convert from fractions to decimals (and back).
- be able to solve application problems involving rational numbers and/or percents.

Textbooks and Materials: Precalculus – 3rd Edition, Prentice Hall,
Robert Blitzer, 2007

Semester Grading Policy: Quarter 1 (3) – 40%, Quarter 2 (4) – 40%, Semester exam – 20%

Scope & Sequence: Refer to the individual instructor for a week-by-week breakdown of standards alignment, instructional content, and major assessments.