

## COURSE SYLLABUS

**Curriculum Area:** Mathematics

**Length of Course:** 1 Year

**Course Title:** Pre-Calculus/Trigonometry

**Status of Course:** Continuing

**Prerequisite(s):** Honors Algebra II or Algebra II

**District Adopted Materials:** Advanced Mathematics, a Pre-Calculus Course, Richard G. Brown and David P. Robbins. Houghton Mifflin Company, 2004

**Supplemental Materials:** Pre-Calculus with Trigonometry, Foerster. Addison-Wesley, 2004  
Plane Trigonometry, 3rd Edition, Rice and Strange. Prindle, Weber and Schmidt, 2003  
Trigonometry, 4th Edition, Larson, Hostetler. Heath, 2003

**Course Description and Purpose:** The standards below outline the content for a one-year course in Pre-Calculus/Trigonometry. This course is intended to extend students' knowledge of function characteristics, equation solving, and trigonometric concepts. Students enrolled in Pre-Calculus/Trigonometry are assumed to have mastered second year algebra concepts and have some exposure to trigonometry. The content of this course will serve as appropriate preparation for a calculus course. Graphing utilities will be used by students and teachers. Graphing utilities enhance the understanding of realistic applications through modeling and aid in the investigation of functions and their inverses. They also provide a powerful tool for investigating mathematical ideas and solving and verifying equations and inequalities. Any other technology that will enhance student learning should be used if available. A graphics calculator is strongly recommended for this course. A specific type will be suggested by the teacher and the cost is about \$85.00.

**Expected Student Results:**

**At the end of the course, the student will be expected to:**

1. Use reason and logic to evaluate information, perceive patterns, identify relationships, formulate questions, pose problems and make and test conjectures. [A.12.1]
2. Communicate logical arguments and clearly show why a result does or does not make sense, why reasoning is or is not valid, and an understanding of the difference between examples that support a conjecture and a proof of the conjecture. [A.12.2]
3. Analyze non-routine problems and arrive at solutions by various means, including models and simulations, often starting with provisional conjectures and

- progressing, directly or indirectly, to a solution, justification or counter-example. [A.12.3]
4. Develop effective oral and written presentations employing correct mathematical terminology, notation, symbols, and conventions for mathematical arguments and display of data. [A.12.4]
  5. Organize work and present mathematical procedures and results clearly, systematically, succinctly and correctly. [A.12.5]
  6. Read and understand mathematical texts and other instructional materials. [A.12.6]
  7. Investigate and identify the characteristics of polynomial and rational functions and use these to sketch the graphs of these functions. This will include determining domain and range, zeros, x- and y-intercepts, symmetry, asymptotes, and maximum and minimum points. Graphing utilities will be used to investigate and verify these characteristics. [F.12.2]
  8. Solve polynomial equations by both algebraic and graphical methods. Solutions will include complex zeros. [F.12.3]
  9. Solve equations and inequalities involving absolute value, rational, or radical expressions both algebraically and graphically. [F.12.3]
  10. Solve systems of equations including linear, linear-quadratic, and quadratic-quadratic systems both algebraically and graphically. [F.12.3]
  11. Perform operations on functions, including composition and inversion, and determine the domain and range of the results.
  12. Apply the techniques of horizontal and vertical translation, horizontal and vertical stretch, and reflection in the coordinate plane to graphing functions, including trigonometric functions.
  13. Investigate and identify the characteristics of exponential and logarithmic functions in order to graph these functions and to solve equations and practical problems. This will include the role of  $e$ , natural and common logarithms, laws of exponents and logarithms, and the solution of logarithmic and exponential equations. [F.12.2]
  14. Perform operations on complex numbers and express results in the simplest form.
  15. Solve problems involving arithmetic and geometric sequences and series.
  16. Use the definitions of the six trigonometric functions to find the sine, cosine, tangent, cotangent, secant, and cosecant of an angle in standard position, given a point on the terminal side of the angle other than the origin. Circular function definitions will be connected with the trigonometric function definitions.
  17. Given the value of one trigonometric function, find the values of the other trigonometric functions. Properties of the unit circle and definitions of circular functions will be applied.
  18. Find the values of the trigonometric functions of the special angles and their related angles as found in the unit circle without the aid of a graphing calculator. This will include converting radians to degrees and vice versa.
  19. Use a calculator to find the value of any trigonometric function and inverse trigonometric function.

20. Verify basic trigonometric identities and make substitutions using the basic identities.
21. Given one of the six trigonometric functions in standard form ( $y = A f(Bx + C) + D$ ), state the domain and range of the function; determine the amplitude, period, phase shift, and vertical shift; and sketch the graph of the function by using transformations for at least a one-period interval. [F.12.2]
22. Solve trigonometric equations that include both infinite solutions and restricted domain solutions and solve basic trigonometric inequalities.
23. Identify and solve practical problems involving right and oblique triangles. Techniques will include using the trigonometric functions, the Pythagorean Theorem, the Law of Sines, and the Law of Cosines.
- 24.

**Note:** Items in brackets reflect those performance standards that are achieved from the Wisconsin State Standards for mathematics.

### **Course Outline:**

#### **I. Coordinate Geometry - 25 days**

- A. Equations of lines
- B. Points and lines
- C. Parallel and perpendicular lines
- D. Finding equations of lines
- E. Solutions to quadratic equations
- F. The complex numbers
- G. Quadratic equations
- H. Circles
- I. Equations of circles
- J. Intersection of lines and circles

#### **II. Polynomials - 30 days**

- A. Factoring polynomial equations
- B. Polynomials
- C. Solving higher-degree equations
- D. Graphs of polynomial equations
- E. Graphing a quadratic function
- F. Graphing polynomial functions
- G. Roots of polynomial equations
- H. Synthetic division - The Remainder and Factor Theorems
- I. Rational roots of polynomial equations
- J. General results of polynomial equations

#### **III. Linear and polynomial inequalities - 10 days**

- A. Linear inequalities in one variable; absolute value
- B. Polynomial inequalities
- C. Inequalities in two variables

- IV. **Functions - 15 days**
- A. Functions and their graphs
  - B. Definition of a function
  - C. Graphs of functions
  - D. Relations among functions
  - E. The composition of functions
  - F. Forming function from verbal descriptions
  - G. Inverse functions
- V. **Exponents and Logarithms - 20 days**
- A. Exponents
  - B. Integral exponents
  - C. Rational exponents
  - D. Exponential functions
  - E. Logarithms
  - F. Logarithmic functions
  - G. Properties of logarithms
  - H. Exponential equation; changing bases
  - I. Exponential growth
  - J. The number **e** and the natural logarithm
- VI. **Sequences and Series - 10 days**
- A. Finite sequences and series
  - B. Arithmetic and geometric sequences
  - C. Arithmetic and geometric series and their sums
  - D. Infinite sequences and series
  - E. Sums of infinite series
- VII. **Trigonometric Functions - 30 days**
- A. Angles, arcs, and sectors
  - B. Measurement of angles
  - C. Sectors of circles
  - D. The trigonometric functions
  - E. The sine and cosine functions
  - F. Evaluating sine and cosine functions
  - G. Other trigonometric functions
  - H. Identities and equations
  - I. Relationships among the functions
  - J. Trigonometric equations
- VIII. **Triangle Trigonometry - 20 days**
- A. Solving triangles and finding their areas
  - B. Right triangle trigonometry
  - C. Area of a triangle
  - D. The Law of Sines
  - E. The Law of Cosines

**Major Assignments/Activities:**

- Teacher-selected activities

**Major Assessments/Tests:**

- Teacher-prepared quizzes and tests

**Grading Procedure:**

- Per School Board Policy

1/23/07