

**Dover-Sherborn High School**  
**Mathematics Curriculum Maps**  
**Pre-Calculus Honors**

A. DESCRIPTION

This course is designed for those students who have displayed considerable ability in previous math courses. In general, students entering the course will have had both Algebra II Honors and Geometry Honors. Pre-Calculus Honors is a rigorous course which enriches all of the topics developed in Pre-Calculus Level I in addition to the study of vectors, parametric and polar functions, conic sections, discrete mathematics, some limits and basic differentiation of algebraic functions (if time allows)

B. OBJECTIVES

[K-12.MP1]; [K-12.MP2]; [K-12.MP3]; [K-12.MP4]; [K-12.MP5]; [K-12.MP6]; [K-12.MP7]; [K-12.MP8]

The student should be able to:

1. understand, apply and graph the six trigonometric functions and their inverses;
2. extend the knowledge acquired in graphing to the concepts of phase displacement, period and amplitude;
3. prove all types of trigonometric identities;
4. find the general solutions to trigonometric equations;
5. apply the laws of sines and cosines;
6. analyze polar equations/functions;
7. analyze polynomial, power, rational, exponential, logarithmic, and logistic functions (algebra 2 review)
8. analyze parametric equations;
9. apply vector techniques to two dimensions;
10. identify and graph equations in both polar and rectangular form;
11. analyze sequences and series;
12. examine some introductory limits including one-sided limits
13. apply the basic formulas for differentiation of algebraic functions (if time allows)

C. OUTLINE

1. Review/expand upon functions discussed in Algebra II
  - a. Domain, range, inverse, operations on functions, piecewise functions
  - b. Interval notation
  - c. Solving equations (linear, quadratic, rational functions) [A.SSE.3a]; [A.SSE.3b]; [A.REI.2]; [A.REI.3]; [A.REI.4]; [A.REI.4a]; [A.REI.4b]; [F.IF.8a]
  - d. Solving linear, quadratic, and rational function inequalities using sign charts. [A.CED.1]
  - e. Graphical analysis of linear, polynomial, rational, exponential, logarithmic, piecewise, and power functions including the use of technology to solve systems of equations [A.REI.11]; [F.BF.3]; [F.IF.4]; [F.IF.5]; [F.IF.6]; [F.IF.7]; [F.IF.7a]; [F.IF.7b]; [F.IF.7d]; [F.IF.7e]; [F.LE.4]; [F.LE.5]
  - f. Compositions of functions [F.BF.1c]
  - g. Inverse functions [F.BF.4]; [F.BF.4a]; [F.BF.4b]; [F.BF.4c]; [F.BF.4d]

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- h. Polynomials, including analyzing the graphs, zeros, factors, etc [A.SSE.1a]; [A.APR.2]; [A.APR.3]; [A.APR.6]; [F.IF.7c]
2. Trigonometry [F.TF.1 through F.TF.9]; [G.SRT.5 through G.SRT.11]
- a. Trigonometry of the right triangle
    - i Definition of trig functions
    - ii Use of tables/calculators
    - iii Solution of right triangles
    - iv Word problems using right triangles
    - v Angles of elevation and depression
    - vi Reciprocal functions and co-functions
    - vii Special angles
    - viii Interpolation
  - b. General angles
    - i Definition of trig functions with extended domain
    - ii Definition of negative angles and their functions
    - iii Reference angles and Quadrantal angles
    - iv Finding values of trig functions
  - c. Radian measure
    - i Changing from degrees to radians and radians to degrees
    - ii Discussion of the unit circle
    - iii Finding arc length
  - d. Solution of oblique triangles and applications
    - i Law of Sines and Cosines
    - ii Applications of Law of Sines and Cosines
    - iii Area of triangle formulas
  - e. Graphs of trigonometric functions [F.IF.7e]
    - i Domain, range amplitude and period
    - ii Graphs of functions with different period and amplitude
    - iii Phase displacement
  - f. Inverse trig functions
    - i Review of the definition of relations and functions
    - ii Finding the inverse
    - iii Graphs of inverse trig functions

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- g. Trig Identities and Trig Equations
  - i Difference between an identity and an equation
  - ii Review quotient, reciprocal and Pythagorean identities
  - iii Proving identities
  - iv Solving trig equations
  - v Solving radical trig equations
- h. General trig relationships
  - i Sum and difference formulas (derivation & application)
  - ii Double angle and half angle formulas (derivation & application)
  - iii Sum-product identities (derivation and Application)
  - iv Proving and solving equations using double angle and half angle formulas
- 3. Conics, Parametric and Polar
  - a. Equations of the different conic sections and their graphs [G.GPE.2]; [G.GPE.3]
  - b. Parametric equations
  - c. Converting points from polar to rectangular and rectangular to polar
  - d. Converting equations from polar to rectangular and rectangular to polar
  - e. Identifying and graphing other curves in polar form, e.g. roses, limacons, etc.
- 4. Vectors [N.VM.1 through N-VM.5b]
  - a. Magnitude and direction
  - b. Finding the vector's angle
  - c. Applications
- 5. Probability [S.CP.1 through S.CP.9]
  - a. Counting methods
  - b. Multiplication principle of counting
  - c. Permutations
  - d. Combinations
  - e. Binomial Theorem [A.APR.5]
  - f. Review of probability rules including conditional probability and independent events
- 6. Sequences and Series [A.SSE.4]; [F.IF.3]; [F.BF.1a]; [F.BF.2]
  - a. Bounded and unbounded sequences/series
  - b. Geometric sequences
  - c. Arithmetic sequences
  - d. Finite series
  - e. Infinite series
  - f. Proofs using mathematical induction

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7. Differentiation of Algebraic Functions (whatever time allows)
  - a. Slope of a function including the difference quotient
  - b. Average rate of change
  - c. Instantaneous rate of change
  - d. Tangents to a curve

D. TEXT

1. Precalculus with Limits, A Graphing Approach, Larson/Hostetler/Edwards, Second Edition  
ISBN 0-669-41758-0
2. Calculus, Finney, Demana, Waits, Kennedy  
ISBN 02013244581

E. RESOURCE MATERIALS

1. Worksheets and notes prepared by teacher
2. Computer programs
3. Polyvision board and qomo tablet
4. Graphing Calculators