STAFFORD COUNTY PUBLIC SCHOOLS

Curriculum Overview
Math Analysis with Trigonometry

Course Description:

   Math Analysis with Trigonometry is considered an advanced mathematics course. Advanced mathematics courses prepare students for the following courses: Dual Enrollment Calculus, Advanced Placement Calculus AB and BC, International Baccalaureate Math Studies, and International Baccalaureate Mathematics. The Advanced curriculum provides highly motivated and academically gifted students a program that challenges them. Advanced mathematics courses are designed for gifted mathematics students who have exhibited exceptional performance in their previous mathematics class and demonstrated the readiness to accept the challenge of a rigorous academic course. Math Analysis with Trigonometry is designed to cover the trigonometric functions and their relationships by the circular approach and by the triangular approach. Students will also work with the exponential and logarithmic functions, sequences and series, vectors, parametrics and polar coordinates, and limits. There is no Standards of Learning test for this course. Students who successfully complete this course should take Calculus, Statistics/Probability with Discrete Topics, or AP Calculus, or AP Statistics.

Essential Skills/Processes:

   Math Analysis has its own language. The vocabulary and symbols are very important to a student's understanding of math analysis concepts. Students will use mathematical skills, symbols, and vocabulary to read and communicate about math analysis. Students will apply higher math concepts in solving problems, and will represent real-world situations with mathematical models.

   Technology is an important tool in both learning mathematics and solving problems in mathematics. To use technology appropriately and effectively students must know the basic facts, understand concepts, and be able to estimate and reason logically.

Essential Knowledge:

- Use the definitions of the six trigonometric functions to find the sine, cosine, tangent, cotangent, secant, and cosecant of an angle.
  -circular function definitions will be connected with trigonometric function definitions.
- 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.
- 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 calculating utility.
- Convert radians to degrees and vice versa.
- Solve problems involving arc lengths, linear and angular velocity, and area of a sector.
- Use a calculator to find the value of any trigonometric function and inverse trigonometric function.
- Verify basic trigonometric identities and make substitutions using the basic identities.
- Given one of the six trigonometric functions in standard form (e.g., $y = A\sin(Bx + C) + D$, where A, B, C, and D are real numbers), will
  -state the domain and the 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.
  The graphing calculator will be used to investigate the effect of changing A, B, C, and D on the graph of a trigonometric function.
- Identify the domain and range of the inverse trigonometric functions and recognize the graph, noting any restrictions on the domain.
- Solve trigonometric equations and solve basic trigonometric inequalities.
  Graphing utilities will be used to solve equations, to check for reasonableness of results, and to verify algebraic solutions.

- Identify, create, and solve practical problems involving triangles and vectors.
  Techniques will include using the trigonometric functions, the Pythagorean Theorem, the Law of Sines, and the Law of Cosines
- Investigate polynomial and rational functions.
  -identify the zeros, upper and lower bounds, y-intercepts, symmetry, asymptotes, intervals for which the function is increasing or decreasing, and maximum or minimum points.
  Graphing utilities will be used to investigate and verify these characteristics.
- Perform operations, including composition and inversion of functions, and determine the domain and range of results.
  -curve sketching and transformations will be included.
  Graphing utilities will be used to investigate and verify the graphs.
- Use graphs to investigate and describe the continuity of functions.
  -absolute value, piece-wise-defined and step functions will be included.
- Expand binomials having positive integral exponents.
  -use the Binomial Theorem;
  -the formula for combinations;
  -Pascal's Triangle.
- Solve problems involving arithmetic and geometric sequences and series.
  -find the sum (sigma notation included) of finite and infinite convergent series that lead to an intuitive approach to a limit.
- Apply the method of mathematical induction to prove formulas/statements.
- Find the limit of an algebraic function, if it exists, as the variable approaches either a finite number or infinity.
  Graphing utility will be used to verify intuitive reasoning, algebraic methods, and numerical substitution.
- Investigate the techniques of translation and rotation of axes in the coordinate plane to graphing functions and conic sections.
  A graphing utility will be used to investigate and verify the graphs.
- Investigate and identify the characteristics of exponential and logarithmic functions in order to graph these functions and to solve equations and practical problems.
  -include e, natural and common logarithms, laws of exponents and logarithms, solve logarithmic and exponential equations.
  Graphing utilities will be used to investigate and verify the graphs and solutions.
- Investigate and identify the characteristics of the graphs of polar equations using graphing utilities.
  -classification polar equations.
  -identify the effects of changes in the parameters in polar equations.
  -convert complex numbers from rectangular form to polar form and vice versa.
  -find the intersection of the graphs of polar equations.
- Perform operations with vectors in the coordinate plane and solve practical problems using vectors.
- Use parametric equations to model and solve application problems.
  Graphing utilities will be used to develop an understanding of the graph of parametric equations.

- **Resources:**
- Stafford County Public Schools: http://stafford.schoolfusion.us/ .
- High School Course Catalog: http://stafford.schoolfusion.us/ . Click on "For Parents/Students" tab.
- VA Mathematics Standards of Learning:
  http://www.doe.virginia.gov/testing/sol/standards_docs/mathematics/review.shtml
- School Report Card (VA Department of Education):
  http://www.doe.virginia.gov/statistics_reports/school_report_card/index.shtml