INTRODUCTORY ANALYSIS

Standard #1 Number, Number Sense, and Operations Standard

Students demonstrate number sense including an understanding of number systems and of operations and how they relate to one another. Students compute fluently and make reasonable estimates using paper-and-pencil, technology supported, and mental models.

- **Estimate answers, demonstrate an understanding of the complex number system by developing facility with its operation.**
- **Compare and contrast the following number systems: real, rational, irrational, and the complex.**
- **Perform all arithmetic operations in the real, rational, irrational, and the complex number systems.**
- **Estimate the shapes of graphs of various functions.**
- **Use mental computation and estimation to determine the reasonableness of answers when using technology.**

Standard #2 Measurement Standard

Students estimate and measure to a required degree of accuracy and precision by selecting and using appropriate units, tools, and techniques.

Standard #3 Geometry and Spatial Sense Standard

Students identify, classify, compare, and analyze characteristics, properties, and relationships of one-, two-, and three-dimensional geometric figures and objects. Students use spatial reasoning, properties of geometric objects, and transformations to analyze mathematical situations and solve problems.

- **Explore inductive and deductive reasoning through applications in geometry to various real-world situations.**
- **Deduce properties of figures through the application of vectors.**
- **Represent problem situations with geometric models and apply properties of the figures to determine an appropriate solution.**

Standard #4 Patterns, Functions, and Algebra Standard

Students use patterns, relations, and functions to model, represent, and analyze problem situations that involve variable quantities. Students analyze, model, and solve problems using various representations such as tables, graphs, and equations.

- **Write a description of the commonalties and other relationship between the given trigonometric function and the related circular function.**
- **Use algebraic, power, exponential, and transcendental functions to model real-world phenomena.**
- **Solve trigonometric identities graphically and analytically.**
- **Understand the interrelationships between the algebraic and transcendental functions.**
- **Explore graphs in three-dimensions.**
- **Explore functions with several variables.**
- **Explore the relationships between trigonometric, algebraic, exponential, and logarithmic functions.**
- **Sketch the graph of trigonometric, exponential, and logarithmic functions, with and without technology.**
- **Explore recursive functions with and without technology.**
- **Use vectors to represent two pairs of directions and magnitudes and their sum or difference.**
- **Demonstrate an understanding of sequences, series, and other types of appropriate functions by determining convergences and divergences.**
- **Determine if given complex numbers are zeros of a given function.**
- **Determine, describe and use the inverse relationship between functions including exponential and logarithmic functions.**
- **Describe the graphic relationship between a function and its inverse.**
- **Construct and use matrices to describe and apply transformations.**
- **Develop graphical techniques of solutions for problem situations involving functions.**
- **Demonstrate an understanding of parametric equations by relating the equations to the graphs with and without technology.**
- **Graph linear and higher-order functions with and without technology.**

- **Explore proofs by mathematical induction.**
- **Expand and extend the idea of vectors and linear algebra to higher dimensional situations.**

Standard #5 Data Analysis and Probability Standard

Students pose questions and collect, organize, represent, interpret, and analyze data to answer those questions. Students develop and evaluate inferences, predictions, and arguments that are based on data.

- **Use sampling and recognize its role in statistical claims.**
- **Design a statistical experiment to study a problem, conduct the experiment, and interpret and communicate the outcomes.**
- **Describe, in general terms, the normal curve and use its properties.**
- **Create and interpret discrete probability distribution.**
- **Understand and apply the concept of a random variable to generate and interpret probability distribution, including binomial, uniform, normal, and chi square.**

Standard #6 Mathematical Processes Standard

Students use mathematical processes and knowledge to solve problems. Students apply problem-solving and decision-making techniques, and communicate mathematical ideas.

- **Apply problem solving strategies and evaluate processes, strategies, calculations, and solutions to verify reasonableness; and use mathematical reasoning to validate and/or generalize approaches, arguments, strategies, and solutions.**
- **Communicate mathematical ideas, reasoning, and solutions through the use of appropriate mathematical terminology, notations, symbols, definitions, models, and other representations.**