DeSoto County High School

Pre-calculus

Curriculum Calendar

2011-2012

UNIT/ORGANIZING PRINCIPLE: Functions and Their Graphs				**Pacing: 1st 9-weeks Days 1 – 20**
Essential Question: Can students identify the domain and range from a relation, equation, or graph? Can students manipulate functions through transformations, operations, and compositions?				**Big Idea : Functions**
Concepts/ Content	**Learning Target/Skills**	**Benchmarks**	**Essential Content and Understanding**	**Terminology**
• **Basic Functions/Identify and find their domain and range** • **Manipulate graphs through transformations**	Determine the domain and range of a relation. Describe the concept of a function, use function notation, determine whether a given relation is a function, and link equations to functions. Identify and graph common functions (including but not limited to linear, rational, quadratic, cubic, radical, absolute value). Describe and graph transformations of functions Recognize, interpret, and graph functions defined piece-wise with and without technology.	MA.912.A.2.4 Moderate MA. 912.A.2.3 Moderate MA.912.A.2.6 Moderate MA.912.A.2.10 Moderate MA.912.A.2.9 Moderate	Graph polynomial functions with and without technology and describe end behavior Understand and use the intermediate value theorem on a function over a closed interval Use theorem of polynomial behavior (including but not limited to the Fundamental Theorem of Algebra, Remainder Theorem, and the Rational Root Theorem, Descartes' Rule of Signs, and the Conjugate Root Theorem) to find the zeros of a polynomial function Write and polynomial equation for a	Polynomial Equations Quadratic equations Cubic Equations Rational Functions Roots, Solutions, Zeros, and x – intercepts Vertex of a quadratic Completing the square General and vertex form Vertical and horizontal asymptotes Oblique (slant) asymptotes Fundamental Theorem of Algebra Rational Root Test Descartes' Rule of Signs Complex numbers

	Perform operations (addition, subtraction, division, and multiplication) of functions algebraically, numerically, and graphically. Determine the composition of function s . Solve problems involving functions and their inverses. Create a graph to represent a real-world situation.	MA.912.A.2.7 Moderate MA.912.A.2.8 Low MA.912.A.2.11 High MA.912.A.2.1 Moderate	given set of real and/or complex roots Describe the relationships among the solutions of an equation, the zeros of a function, the x – intercepts of a graph, and the factors of a polynomial expression with and without technology Identify removable and non-removable discontinuities, and vertical, horizontal, and oblique asymptotes of a graph of a rational function, find the zeros, and graph the function	Conjugate root theorem Intermediate Value Theorem Long Division of Polynomials Division Algorithm Synthetic Division Multiplicity of a solution

UNIT/ORGANIZING PRINCIPLE: Exponential and Logarithmic Functions				**Pacing: 1st 9-weeks Days 21 - 40**
Essential Question: Can students graph, manipulate, and determine the domain and range of an exponential and logarithmic function?				**Big Idea : Exponents and Logarithms**
Concepts/ Content	**Learning Target/Skills**	**Benchmarks**	**Essential Content and Understanding**	**Terminology**
• **Identify domain, range, and graph exponential and logarithmic functions** • **Solve exponential and logarithmic equations**	Define exponential and logarithmic functions and determine their relationship Define and use the properties of logarithms to simplify logarithmic expressions and to find their approximate values. Graph exponential and logarithmic functions. Prove laws of logarithms Solve logarithmic and exponential equations. Use the change of base formula. Solve applications of exponential growth and decay.	MA.912.A.8.1 Moderate MA.912.A.8.2 Low MA.912.A.8.3 Moderate MA.912.A.8.4 High MA.912.A.8.5 Moderate MA.912.A.8.6 Low MA.912.A.8.7 High	Define exponential and logarithmic functions and determine their relationship Define and use the properties of logarithms to simplify logarithmic expressions and to find their approximate values Graph exponential and logarithmic functions Prove laws of logarithms Solve logarithmic and exponential equations Use the change of base formula Solve applications of exponential growth and decay	Exponential function Logarithmic function Natural base Natural exponential function Common logarithmic function Natural logarithmic function Change of base formula Exponential growth and decay models

UNIT/ORGANIZING PRINCIPLE: Trigonometric Functions	**Pacing: 1st/2nd 9-weeks Days 41 - 66**
Essential Question: Can students use the unit circle to evaluate a trigonometric expression of any angle? **Can students convert between degree and radian measures?** **Do students understand the connection between right triangle trigonometry and the unit circle?** **Can students solve problems involving right triangle trigonometry?** **Can students define and graph trigonometric functions with and without technology?** **Can students use trigonometric functions to model and solve real-life problems?**	**Big Idea : Trigonometry**

Concepts/ Content	**Learning Target/Skills**	**Benchmarks**	**Essential Content and Understanding**	**Terminology**
• Six trigonometric functions and their relationship with triangles • Graphing trigonometric functions	Convert between degree and radian measures Define and determine sine and cosine using the unit circle. State and use exact values of trigonometric functions for special angles: multiples of $\frac{\pi}{6}$ and $\frac{\pi}{4}$ (degree and radian measures). Find approximate values of trigonometric and inverse trigonometric functions using appropriate technology. Make connections between right triangle ratios, trigonometric functions, and circular	MA.912.T.1.1 Moderate MA.912.T.1.2 Moderate MA.912.T.1.3 Low MA.912.T.1.4 Low MA.912.T.1.5 Moderate	Convert between degree and radian measures Define and determine sine and cosine using the unit circle. State and use exact values of trigonometric functions for special angles: multiples of $\pi/6$ and $\pi/4$ (degree and radian measures) Find approximate values of trigonometric and inverse trigonometric functions using appropriate technology Make connections between right	Trigonometry Angle Initial side Terminal side Vertex Positive angles Negative angles Coterminal angles Central angle Radian Complementary angles Supplementary angles Degree Unit circle Sine

	functions. Make connections between right triangle ratios, trigonometric functions, and circular functions. Solve real-world problem s involving right triangle s using technology when appropriate. Define and graph trigonometric functions using domain, range, intercepts, period, amplitude, phase shift, vertical shift, and asymptotes with and without the use of graphing technology. Solve real-world problem s involving applications of trigonometric functions using graphing technology when appropriate.	MA.912.T.2.1 Moderate MA.912.T.2.2 High MA.912.T.1.6 High MA.912.T.1.8 High	triangle ratios, trigonometric functions, and circular functions Define and use the trigonometric ratios (sine, cosine, tangent, cotangent, secant, cosecant) in terms of angles of right triangles Solve real world problems involving right triangles using technology when appropriate Define and graph trigonometric functions using domain, range, intercepts, period, amplitude, phase shift, vertical shift, and asymptotes with and without the use of graphing technology Define and graph inverse trigonometric relations and functions Solve real world problems involving applications of trigonometric functions using graphing technology when appropriate	Cosine Tangent Cotangent Secant Cosecant Period Amplitude Phase shift Reference angle Hypotenuse Opposite side Adjacent side Inverse sine function Inverse cosine function Inverse tangent function

UNIT/ORGANIZING PRINCIPLE: Analytic Trigonometry				**Pacing: 2nd 9-weeks Days 67 - 88**
Essential Question: Can students use the trigonometric identities to simplify trigonometric expression, verify trigonometric identities, and solve trigonometric equations? **Can students use the sum and difference formula, multiple and half angle formulas to rewrite and evaluate trigonometric functions?**				**Big Idea : Trigonometry**
Concepts/ Content	**Learning Target/Skills**	**Benchmarks**	**Essential Content and Understanding**	**Terminology**
• Basic Trigonometric Identities **• Pythagorean Identities**	Verify the basic Pythagorean identities, such as $sin^2x + cos^2x = 1$, and show they are equivalent to the Pythagorean theorem. Use basic trigonometric identities to verify other identities and simplify expressions. Use the sum and difference, half-angle and double-angle formulas for sine, cosine, and tangent, when formulas are provided. Solve trigonometric equations and real-world problem s involving applications of trigonometric equations using technology when appropriate.	MA.912.T.3.1 Moderate MA.912.T.3.2 Moderate MA.912.T.3.3 Moderate MA.912.T.3.4 High	Verify the basic Pythagorean identities, such as i) sin2 x + cos2 x = 1, and show they are equivalent to the Pythagorean Theorem Use basic trigonometric identities to verify other identities and simplify expressions Use the sum and difference, half-angle and double-angle formulas for sine, cosine, and tangent, when formulas are provided Solve trigonometric equations and real world problems involving applications of trigonometric equations using technology when appropriate	Pythagorean identities Sum and difference formulas Double angle formulas Half-angle formulas

UNIT/ORGANIZING PRINCIPLE: Additional Topics in Trigonometry				**Pacing: 2nd /3rd 9-weeks Days 89 - 108**
Essential Question: Can students use the Law of Sines and Cosines to solve real world problems? Can students connect trigonometry to the use of vectors and their application in the real world? Can students do basic operations with vectors?				**Big Idea : Trigonometry**
Concepts/ Content	**Learning Target/Skills**	**Benchmarks**	**Essential Content and Understanding**	**Terminology**
• **Law of Sines and Law of Cosines and their applications** • **Vectors** • **Application of vectors**	Apply the laws of sines and cosines to solve real-world problem s using technology. Use the area of triangles given two sides and an angle or three sides to solve real-world problems. Demonstrate an understanding of the geometric interpretation of vectors and vector operations including addition, scalar multiplication, dot product, and cross product in the plane and in three-dimensional space. Demonstrate an understanding of the algebraic interpretation of vectors and vector operations including addition, scalar multiplication, dot product, and cross product in the plane and in three-	MA.912.T.2.3 High MA.912.T.2.4 Moderate MA.912.D.9.1 Moderate MA.912.D.9.2 Moderate	Apply the law of sines and cosines to solve real world problems using technology Use the area of triangles given two sides and an angle or three sides to solve real world problems Demonstrate an understanding of the geometric interpretation of vectors and vector operations including addition, scalar multiplication, dot product, and cross products in the plane and in three-dimensional space Demonstrate an understanding of the algebraic	Vectors Dot Product Scalar Complex Numbers DeMoivre's Theorem

	dimensional space. Define the trigonometric form of complex number s, convert complex number s to trigonometric form, and multiply complex number s in trigonometric form. Apply DeMoivre's theorem to perform operations with complex numbers.	 MA.912.T.4.4 Moderate MA.912.T.4.5 Moderate	interpretation of vectors and vector operations including addition, scalar multiplication, dot product, and cross products in the plane and in three-dimensional space Use vectors to model and solve application problems Define the trigonometric form of complex numbers, convert complex numbers to trigonometric form, and multiply complex numbers in trigonometric form Apply DeMoivre's theorem to perform operations with complex numbers	

UNIT/ORGANIZING PRINCIPLE: Sequences and Series	**Pacing: 3rd 9-weeks Days 109 - 132**
Essential Question: **Can students write a rule for arithmetic and geometric sequences?** **Can students find the finite or infinite sum of an arithmetic or geometric series?** **Can students use proof by induction to verify the sum formula for series?**	**Big Idea : Sequences and Series**

Concepts/ Content	Learning Target/Skills	Benchmarks	Essential Content and Understanding	Terminology
• **Arithmetic Sequences and Series** • **Geometric Sequences and Series** • **Proof by Induction**	Define arithmetic and geometric sequences and series Use sigma notation to describe series Find specified terms of arithmetic and geometric sequences Find partial sums of arithmetic and geometric series, and find sums of infinite convergent series. Use sigma notation where applicable. Explore and use other sequences found in nature such as Fibonacci sequence and the golden ratio	MA.912.D.11.1 Low MA.912.D.11.2 Low MA.912.D.11.3 Low MA.912.D.11.4 Moderate MA.912.D.11.5 Moderate	Define arithmetic and geometric sequences and series. Find partial sums of arithmetic and geometric series, and find sums of infinite convergent geometric series. Use Sigma notation where applicable. Use mathematical induction to prove various concepts in number theory (such as sums of infinite integer series, divisibility statements, and parity statements), recurrence relations, and other applications.	Infinite sequence Finite sequence Recursive Factorial Summation or sigma notation Infinite series Finite series or nth partial sum Arithmetic sequences Geometric sequences Infinite geometric series Mathematical induction Binomial coefficients Binomial theorem Pascal's triangle

	Use mathematical induction to prove various concepts in number theory (such as sums of infinite integer series, divisibility statements, and parity statements), recurrence relations, and other applications	MA.912.D.1.3 High		

UNIT/ORGANIZING PRINCIPLE: Conic Sections				**Pacing: 3rd /4th 9-weeks Days 133 - 152**
Essential Question: Can students change conics in general form to standard form? **Can students graph conics using the center, vertices, foci, directrix (parabolas), asymptotes (hyperbolas)?** **Can students write the equation of a conic in standard form when given information about the graph?**				**Big Idea : Conics**
Concepts/ Content	**Learning Target/Skills**	**Benchmarks**	**Essential Content and Understanding**	**Terminology**
• **Circles** • **Ellipses** • **Parabola** • **Hyperbola**	Write the equations of conic section s in standard form and general form, in order to identify the conic section and to find its geometric properties (foci, asymptotes, eccentricity, etc.). Graph conic section s with and without using graphing technology. Solve real-world problem s involving conic sections.	MA.912.A.9.1 Moderate MA.912.A.9.2 Moderate MA.912.A.9.3 High	Write the equations of conic sections in standard form and general form, in order to identify the conic section and to find it geometric properties (foci, asymptotes, eccentricity, etc) Graph conic sections with and without using graphing Technology Solve real world problems involving conic sections	Conic section Parabola Directrix Focus or foci Ellipse Vertices Major axis Minor axis Center Eccentricity Hyperbola Transverse axis Conjugate axis

UNIT/ORGANIZING PRINCIPLE: Parametric and Polar Equations				**Pacing: 4th 9-weeks Days 153 - 165**
Essential Question: Can students convert rectangular equations to parametric and polar equations and vice versa? **Can students convert between rectangular and polar coordinates?** **Can students identify special polar graphs (circle, rose curve, limacon, lemniscates) from the graph and equations?** **Can students identify the conic section in polar form?**				**Big Idea : Parametric and Polar Equations**
Concepts/ Content	**Learning Target/Skills**	**Benchmarks**	**Essential Content and Understanding**	**Terminology**
• **Parametric Equations** • **Polar coordinate and equations** • **Conics in Polar form**	Sketch the graph of a curve in the plane represented parametrically, indicating the direction of motion. Convert from a parametric representation of a plane curve to a rectangular equation and vice-versa. Use parametric equations to model applications of motion in the plane. Define polar coordinates and relate polar coordinates to Cartesian coordinates with and without the use of technology. Represent equations given in rectangular coordinates in terms of polar coordinates .	MA.912.D.10.1 Moderate MA.912.D.10.2 Low MA.912.D.10.3 Moderate MA.912.T.4.1 Moderate MA.912.T.4.2 Moderate	Sketch the graph of a curve in the plane represented parametrically, indicating the direction of motion Convert from a parametric representation of a plane curve to a rectangular equation and vice versa. Use parametric equations to model applications of motion in the plane Define polar coordinates and relate polar coordinates to Cartesian coordinates with and	Parameter Parametric equations Plane curve Orientation Polar coordinate system Pole or origin Polar axis Polar coordinates

	Graph equations in the polar coordinate plane with and without the use of graphing technology.	MA.912.T.4.3 Moderate	without the use of technology Represent equations given in rectangular coordinates in terms of polar coordinates Graph equations in the polar coordinate plane with and without the use of graphing technology	

UNIT/ORGANIZING PRINCIPLE: Introduction to Calculus				**Pacing: 4th 9-weeks Days 166 - 180**
Essential Question: Can the students evaluate the limit of a function, including one-sided limits, using graphs, tables, technology, and direct substitution? Can the students use the properties of limits to evaluate limits? Do students understand when a function is continuous or discontinuous, and the types of discontinuities? Can the students use the definition of derivative on basic functions? Can students find the area under a curve using the limit definition?				**Big Idea : Calculus**
Concepts/ Content	**Learning Target/Skills**	**Benchmarks**	**Essential Content and Understanding**	**Terminology**
• **Limits** • **Definition of Derivative** • **Area under the Curve**	Understand the concept of limit and estimate limits from graphs and tables of values. Find limits by substitution. Find limits of sums, differences, products, and quotients. Find limits of rational functions that are undefined at a point. Understand continuity in terms of limits. Decide if a function is continuous at a point.	MA.912.C.1.1 Moderate MA.912.C.1.2 Low MA.912.C.1.3 Low MA.912.C.1.4 Low MA.912.C.1.9 High MA.912.C.1.10 High	Understand the concept of limit and estimate limits from graphs and tables of values Find limits by substitution Find limits of sums, differences, products, and quotients Find limits of rational functions that are undefined at a point Find one-sided limits Understand continuity in terms of limits	Limit Continuous Discontinuous Interval Extreme value theorem

	Find the types of discontinuities of a function. Understand and use the intermediate value theorem on a function over a closed interval. Understand and apply the extreme value theorem : If f(x) is continuous over a closed interval, then f has a maximum and a minimum on the interval.	MA.912.C.1.11 Moderate MA.912.C.1.12 Moderate MA.912.C.1.13 Moderate	Decide if a function is continuous at a point Find the types of discontinuities of a function Understand and use the intermediate value theorem on a function over a closed interval. Understand and apply the extreme value theorem: If f(x) is continuous over a closed interval, then f has a maximum and a minimum on the interval	

UNIT/ORGANIZING PRINCIPLE: Additional Learning Strategies				**Pacing: Throughout the course where appropriate**
Essential Question: Can the student use appropriate language arts strategies to achieve success in mathematics?				**Big Idea : Learning Strategies**
Concepts/ Content	**Learning Target/Skills**	**Benchmarks**	**Essential Content and Understanding**	**Terminology**
N/A	The student will use new vocabulary that is introduced and taught directly; The student will use background knowledge of subject and related content areas, prereading strategies (e.g., previewing, discussing, generating questions), text features, and text structure to make and confirm complex predictions of content, purpose, and organization of a reading selection; The student will identify cause-and-effect relationships in text; The student will prewrite by making a plan for writing that addresses purpose, audience, a controlling idea, logical sequence, and time frame for completion; The student will prewrite by using organizational strategies and tools (e.g.,	LA.1112.1.6.1 LA.1112.1.7.1 LA.1112.1.7.4 LA.1112.3.1.2 LA.1112.3.1.3	The student will use new vocabulary that is introduced and taught directly. The student will use background knowledge of subject and related content areas, prereading strategies (e.g., previewing, discussing, generating questions), text features, and text structure to make and confirm complex predictions of content, purpose, and organization of a reading selection. The student will identify cause-and-effect relationships in text. The student will prewrite by making a plan for writing that addresses purpose, audience, a	N/A

	technology, spreadsheet, outline, chart, table, graph, Venn Diagram, web, story map, plot pyramid) to develop a personal organizational style The student will draft writing by establishing a logical organizational pattern with supporting details that are substantial, specific, and relevant.	LA.1112.3.2.2	controlling idea, logical sequence, and time frame for completion The student will prewrite by using organizational strategies and tools (e.g., technology, spreadsheet, outline, chart, table, graph, Venn Diagram, web, story map, plot pyramid) to develop a personal organizational style. The student will draft writing by establishing a logical organizational pattern with supporting details that are substantial, specific, and relevant.	