

Mathematical Analysis Curriculum Guide
Lunenburg County Public Schools
2014 – 15

Marking Period: 1

Days: 8

Reporting Category/Strand: EQUATIONS

SOL MA.14	The student will use matrices to organize data and will add and subtract matrices, multiply matrices, multiply matrices by a scalar, and use matrices to solve systems of equations.
Essential Knowledge/Skills/Understandings	<p>Essential Knowledge/Skills: The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to</p> <ul style="list-style-type: none"> ● Add, subtract, and multiply matrices and multiply matrices by a scalar. ● Model problems with a system of no more than three linear equations. ● Express a system of linear equations as a matrix equation. ● Solve a matrix equation. ● Find the inverse of a matrix. ● Verify the commutative and associative properties for matrix addition and multiplication. <p>Essential Understandings:</p> <ul style="list-style-type: none"> ● Matrices are a convenient shorthand for solving systems of equations. ● Matrices can model a variety of linear systems. ● Solutions of a linear system are values that satisfy every equation in the system. ● Matrices can be used to model and solve real-world problems.
Essential Questions	Where in real life do we see matrices in use?
Primary Resources	Math Planet - Using matrices when solving a system of equations She Loves Math - matrices and solving systems Interactive Achievement
Essential Vocabulary	Please refer to previously taught mathematics vocabulary.

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Marking Period: 1

Days: 17

Reporting Category/Strand: ANALYTIC GEOMETRY

SOL MA.13	The student will identify, create, and solve real-world problems involving triangles. Techniques will include using the trigonometric functions, the Pythagorean Theorem, the Law of Sines, and the Law of Cosines.
Essential Knowledge/Skills/Understandings	<p>Essential Knowledge/Skills: The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to</p> <ul style="list-style-type: none"> ● Solve and create problems, using trigonometric functions. ● Solve and create problems, using the Pythagorean Theorem. ● Solve and create problems, using the Law of Sines and the Law of Cosines. ● Solve real-world problems using vectors. <p>Essential Understandings:</p> <ul style="list-style-type: none"> ● Real-world problems can be modeled using trigonometry and vectors.
Essential Questions	<p>What is the purpose of the trigonometric identities, sum, and difference formulas, multiple-angle formulas and product-to-sum formulas? What are trigonometric functions used to model in real life? Why do we use the Law of Sines and the Law of Cosines? Why should trigonometry be studied?</p>
Primary Resources	<p>Khan Academy (Law of Cosines) Khan Academy (Law of Cosines) Cut the Knot - Law of Sines and Law of Cosines FOOPLOT Geogebra Interactive Achievement</p>
Essential Vocabulary	Please refer to previously taught mathematics vocabulary.

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Marking Period: 2

Days: 15

Reporting Category/Strand: EQUATIONS

<p>SOL MA.10</p>	<p>The student will investigate and identify the characteristics of the graphs of polar equations, using graphing utilities. This will include classification of polar equations, the effects of changes in the parameters in polar equations, conversion of complex numbers from rectangular form to polar form and vice versa, and the intersection of the graphs of polar equations.</p>
<p>Essential Knowledge/Skills/Understandings</p>	<p>Essential Knowledge/Skills: The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to</p> <ul style="list-style-type: none"> ● Recognize polar equations (rose, cardioid, limaçon, lemniscate, spiral, and circle), given the graph or the equation. ● Determine the effects of changes in the parameters of polar equations on the graph, using a graphing utility. ● Convert complex numbers from rectangular form to polar form and vice versa. ● Find the intersection of the graphs of two polar equations, using a graphing utility. <p>Essential Understandings:</p> <ul style="list-style-type: none"> ● The real number system is represented geometrically on the number line, and the complex number system is represented geometrically on the plane where $a + bi$ corresponds to the point (a, b) in the plane.
<p>Essential Questions</p>	<p>What are parametric equations used for? Why is the polar coordinate system studied?</p>
<p>Primary Resources</p>	<p>ANALYZEMATH - Graphing Polar Equations ANALYZEMATH - Convert Polar to Rectangular and Vice Versa ANALYZEMATH - Convert Rectangular Equations to Polar Equations ANALYZEMATH - Convert Polar Equations to Rectangular Equations FOO PLOT Geogebra Interactive Achievement</p>

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Essential Vocabulary	Please refer to previously taught mathematics vocabulary.
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Marking Period: 2

Days: 10

Reporting Category/Strand: ANALYTIC GEOMETRY

SOL MA.8	The student will investigate and identify the characteristics of conic section equations in (h, k) and standard forms. Transformations in the coordinate plane will be used to graph conic sections.
Essential Knowledge/Skills/Understandings	<p>Essential Knowledge/Skills: The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to</p> <ul style="list-style-type: none"> ● Given a translation or rotation matrix, find an equation for the transformed function or conic section. ● Investigate and verify graphs of transformed conic sections, using a graphing utility. <p>Essential Understandings:</p> <ul style="list-style-type: none"> ● Matrices can be used to represent transformations of figures in the plane.
Essential Questions	<p>What are conic sections used for? Why are the circle, parabola, hyperbola, and ellipse called conics? How can we write the equation of a conic given specific information? How are conics related to the real world?</p>
Primary Resources	<p>Math Centre - Conics (PDF) Stewart Calculus (PDF) Conic Section Formulas (PDF) FOOPLOT Geogebra Interactive Achievement</p>

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Essential Vocabulary	Please refer to previously taught mathematics vocabulary.
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Marking Period: 3

Days: 12

Reporting Category/Strand: FUNCTIONS

SOL MA.9	The student will investigate and identify the characteristics of exponential and logarithmic functions in order to graph these functions and solve equations and real-world 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.
Essential Knowledge/Skills/Understandings	<p>Essential Knowledge/Skills: The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to</p> <ul style="list-style-type: none"> ● Identify exponential functions from an equation or a graph. ● Identify logarithmic functions from an equation or a graph. ● Define e, and know its approximate value. ● Write logarithmic equations in exponential form and vice versa. ● Identify common and natural logarithms. ● Use laws of exponents and logarithms to solve equations and simplify expressions. ● Model real-world problems, using exponential and logarithmic functions. ● Graph exponential and logarithmic functions, using a graphing utility, and identify asymptotes, intercepts, domain, and range. <p>Essential Understandings:</p> <ul style="list-style-type: none"> ● Exponential and logarithmic functions are inverse functions.

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	<ul style="list-style-type: none"> ● Some examples of appropriate models or situations for exponential and logarithmic functions are: <ul style="list-style-type: none"> ○ Population growth; ○ Compound interest; ○ Depreciation/appreciation; ○ Richter scale; and ○ Radioactive decay.
Essential Questions	How are exponential and logarithmic functions related? Where in real life do we see exponential and logarithmic models?
Primary Resources	The Math Page - (Logarithmic and exponential functions) Math Is Fun - (Working with exponents and logarithms) Paul's Online Math Notes - (Exponents and Logarithms) Khan Academy - (Exponential and logarithms) Interactive Achievement
Essential Vocabulary	Please refer to previously taught mathematics vocabulary.

Marking Period: 3

Days: 5

Reporting Category/Strand: DISCRETE MATHEMATICS

SOL MA.5	The student will find the sum (sigma notation included) of finite and infinite convergent series, which will lead to an intuitive approach to a limit.
Essential Knowledge/Skills/Understandings	<p>Essential Knowledge/Skills: The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to</p> <ul style="list-style-type: none"> ● Use and interpret the notation: \sum, n, nth, and a_n. ● Given the formula, find the nth term, a_n, for an arithmetic or geometric sequence. ● Given the formula, find the sum, S_n, if it exists, of an arithmetic or geometric series. ● Model and solve problems, using sequence and series information. ● Distinguish between a convergent and divergent series. ● Discuss convergent series in relation to the concept of a limit. <p>Essential Understandings:</p>

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	<ul style="list-style-type: none"> ● Examination of infinite sequences and series may lead to a limiting process. ● Arithmetic sequences have a common difference between any two consecutive terms. ● Geometric sequences have a common factor between any two consecutive terms.
Essential Questions	Why are sequences and series important?
Primary Resources	Math Scoop - Infinite Sequences and Series (Interactive) Calculus Help - Limit is the height a function intends to reach (Video/Interactive) University of California, Davis - Series and Convergence (PDF) Math Centre - Sum of an infinite series (PDF) Purple Math - (Sequences and Series) Interactive Achievement
Essential Vocabulary	Please refer to previously taught mathematics vocabulary.

Marking Period: 3

Days: 8

Reporting Category/Strand: ANALYTIC GEOMETRY

SOL MA.7	The student will find the limit of an algebraic function, if it exists, as the variable approaches either a finite number or infinity. A graphing utility will be used to verify intuitive reasoning, algebraic methods, and numerical substitution.
Essential Knowledge/Skills/Understandings	Essential Knowledge/Skills: The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to <ul style="list-style-type: none"> ● Verify intuitive reasoning about the limit of a function, using a graphing utility. ● Find the limit of a function algebraically, and verify with a graphing utility. ● Find the limit of a function numerically, and verify with a graphing utility.

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	<ul style="list-style-type: none"> • Use limit notation when describing end behavior of a function. <p>Essential Understandings:</p> <ul style="list-style-type: none"> • The limit of a function is the value approached by $f(x)$ as x approaches a given value or infinity.
Essential Questions	<p>What is a limit? Why is it important to have an understanding of infinite value?</p>
Primary Resources	<p>Math Scoop - Infinite Sequences and Series (Interactive) Calculus Help - Limits and Infinity (Video/Interactive) The Math Page - (Infinity) The Math Page - (Limits) Etc.: Calculus Bible App Westerville South Warrior Math - Video Lectures by Mrs. Paxton Video - Calculus Rhapsody (YouTube) GoogleDoc Answer sheet - WSHS Interactive Achievement</p>
Essential Vocabulary	<p>Please refer to previously taught mathematics vocabulary.</p>