WDHS Curriculum Map
Math Analysis

| *Time Interval/ Content* | *Standards/ Strands* | *Essential Questions* | *Skills* | *Assessment* |
|---|---|---|---|---|
| *Unit **1**:*<br>Trigonometric Functions<br><br>*Larson Sections:*<br>4.1-4.4, 4.8<br><br>*CP:*<br>4 weeks<br><br>*Honors:*<br>3 weeks | • F-TF-2: Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers.<br>• F-TF-3: Use special triangles to determine geometrically the values of sine, cosine, tangent, and use the unit circle to express the values of sine, cosine, and tangent.<br>• F-TF-4: Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.<br>• F-TF-7: Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate using technology, and interpret them in terms of context.<br>• G-SRT-8: Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. | • Why should we study trigonometry?<br>• What is the purpose of an inverse trigonometric function?<br>• Describe who you convert between radians and degrees<br>• How is right triangle trigonometry used to solve right triangles?<br>• How is the unit circle used to describe trigonometric functions? | *Students will understand that…*<br>• You can use Trigonometry to analyze all aspects of a geometric figure.<br>• Sine and Cosine functions are often used in scientific calculations.<br>• Inverse trigonometric functions can be useful in exploring how two aspects of a real-life problem relate to each other.<br><br>*Students will know…*<br>• Unit Circle<br>• Trigonometric Functions: Sine, Cosine, Tangent, Cosecant, Secant, and Cotangent<br>• Inverse Trigonometric Functions: Arcsine, Arccosine, and Arctangent<br><br>*Students will be able to…*<br>• Identify a unit circle and describe its relationship to real numbers.<br>• Evaluate trigonometric functions of any angle.<br>• Evaluate inverse trigonometric functions.<br>• Use trigonometric functions to model and solve real-life problems. | • Classwork<br>• Homework<br>• Quizzes<br>• Test |

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| *Unit **2***:<br>Graphs of Trigonometric Functions<br><br>*Larson Sections:*<br>4.5-4.7<br><br>*CP:*<br>4 weeks<br><br>*Honors:*<br>3 weeks | • F-TF-4: Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.<br>• F-TF-5: Choose trigonometric functions to model periodic phenomena with specific amplitude, frequency, and midline.<br>• F-TF-6: Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed. | • What are trigonometric functions used to model in real-life?<br>• How do transformations affect the trigonometric graphs of each function?<br>• How do you graph the basic trigonometric functions on the coordinate plane?<br>• How do you determine the period and amplitude of a trigonometric function without looking at the graph of the function? | *Students will understand that…*<br>• Trigonometric Functions are used to model harmonic and oscillating behavior.<br><br>*Students will know…*<br>• Graphs of Trigonometric Functions: Sine, Cosine, Cosecant, Secant, Tangent, and Cotangent<br>• Amplitude<br>• Period<br>• Phase Shift<br>• Graphs of Inverse Trigonometric Functions: Arcsine, Arccosine, and Arctangent<br><br>*Students will be able to…*<br>• Sketch graphs of trigonometric functions.<br>• Identify the length of period, amplitude and domain and range of trigonometric functions. | • Classwork<br>• Homework<br>• Quizzes<br>• Test<br>• Project |

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| *Unit **3***:<br>Analytics Trigonometry<br><br>*Larson Sections:*<br>5.1-5.5<br><br>*CP:*<br>5 weeks<br><br>*Honors:*<br>4 weeks | • F-TF-8: Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it to find $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ given $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ and the quadrant of the angle.<br>• F-TF-9: Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems. | • What is the purpose of the Trigonometric identities, sum and difference formulas, multiple-angle formulas, and product-to-sum formulas?<br>• How do you graphically solve a trigonometric equation?<br>• How is proving or verifying a trigonometric identity different than solving a trigonometric equation?<br>• What are the relationships between the Pythagorean Identities for Trigonometry? | *Students will understand that…*<br>• Trigonometric identities are used to simplify and evaluate trigonometric functions and expressions.<br>• Sum and difference formulas, multiple-angle formulas, and product-to-sum formulas are used to rewrite and evaluate trigonometric functions.<br>*Students will know…*<br>• Trigonometric Identities: Reciprocal, Quotient, Pythagorean, Cofunction, Even/Odd<br>• Sum and Difference Formulas<br>• Multiple-Angle Formulas<br>• Half-Angle Formulas<br>• Product-to-Sum Formulas<br>*Students will be able to…*<br>• Use the fundamental trig identities to evaluate trig functions and simplify trigonometric expressions.<br>• Verify trigidentities.<br>• Use standard algebraic techniques and inverse trigonometric functions to solve trigonometric equations.<br>• Use sum and difference formulas, multiple-angle formulas, half-angle formulas, and product-to-sum formulas to rewrite and evaluate trigonometric functions. | • Classwork<br>• Homework<br>• Quizzes<br>• Test |

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| *Unit **4***:<br>Law of Sines and Cosines<br><br>*Larson Sections:*<br>6.1-6.2<br><br>*CP:*<br>3 weeks<br><br>*Honors:*<br>3 weeks | • G-SRT-9: Derive the formula $A = 1/2\ ab\sin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.<br>• G-SRT-10: Prove the Laws of Sines and Cosines and use them to solve problems.<br>• G-SRT-11: Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles. | • Why do we use the Law of Sines and Cosines?<br>• What is the relationship of the Law of Cosines, Law of Sines, and area formula to theorems you previously learned?<br>• What is the utility of the Law of Sines and the Law of Cosines?<br>• When is it necessary to use the Law of Sines and the Law of Cosines? | *Students will understand that…*<br>• The Law of Sines and Cosines are used to solve oblique triangles.<br><br>*Students will know…*<br>• Law of Sines and Cosines<br>• Oblique Triangle<br>• Heron's Area Formula<br><br>*Students will be able to…*<br>• Use the Law of Sines and the Law of Cosines to solve oblique triangles.<br>• Find the areas of oblique triangles.<br>• Use Law of Sines and Cosines to model and solve real-life problems. | • Classwork<br>• Homework<br>• Quizzes<br>• Test<br>• Project |

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| *Unit **5***:<br>Vectors<br><br>*Larson Sections:*<br>6.3-6.4*<br><br>*CP:*<br>3 weeks<br><br>*Honors:*<br>2 weeks<br><br>**Section 6.4 Honors Math Analysis Only* | • N-VM-1: Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes.<br>• N-VM-2: Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.<br>• N-VM-3: Solve problems involving velocity and other quantities that can be represented by vectors.<br>• N-VM-4A: Add vectors end-to-end, component wise, and by the parallelogram rule. Understand that the magnitude of a sum of two vectors is typically not the sum of the magnitudes.<br>• N-VM-4B: Given two vectors in magnitude and direction form, determine the magnitude and direction of their sums.<br>• N-VM-4C: Understand vector substitution $\boldsymbol{v} - \boldsymbol{w}$ as $\boldsymbol{v} + (-\boldsymbol{w})$, where –w is the additive inverse of $\boldsymbol{w}$, with the same magnitude as $\boldsymbol{w}$ and pointing in the opposite direction. Represent vector subtraction graphically by connecting the tips in the appropriate order, and perform vector subtraction component-wise.<br>• N-VM-5A: Represent scalar multiplication graphically by scaling vectors and possibly reversing their direction; perform scalar multiplication component-wise.<br>• N-VM-5B: Compute the magnitude of a scalar multiple cv using $\|cv\|=|c|v$. Compute the direction of $cv$ knowing that when $|c|v\neq 0$, the direction of $cv$ is either along $v$ (for $c>0$) or against $v$ (for $c<0$). | • What is a vector?<br>• How do you manipulate vectors with scalars?<br>• How do you multiply vectors with other vectors?<br>• How do you find the dot product of two vectors?<br>• What is the difference between vectors and rays? | *Students will understand that…*<br>• Vectors are used to model quantities that involve both magnitude and direction.<br>*Students will know…*<br>• Vectors<br>• Component Form<br>• Magnitude<br>• Direction Angle<br>• Scalar Multiplication<br>• Vector Addition<br>• Dot Product*<br>*Students will be able to…*<br>• Represent vectors as directed line segments.<br>• Write the component form of vectors.<br>• Perform basic vector operations and represent vectors graphically.<br>• Write vectors as linear combinations of unit vectors.<br>• Find the direction angles of vectors.<br>• Find the dot product of two vectors and use properties of the dot product.*<br>• Write vectors as sums of two vector components.*<br>• Use vectors to model and solve real-life problems.<br><br>*Topics for Honors Math Analysis Only | • Classwork<br>• Homework<br>• Quizzes<br>• Test |

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| *Unit **6**:* Linear Systems and Matrices<br><br>*Larson Sections:* 7.3-7.8<br><br>*CP: **7.3-7.7*** 4 weeks<br><br>*Honors:* 4 weeks | • A-REI-8: Represent a system of linear equations as a single matrix equation in a vector variable.<br>• A-REI-9: Find the inverse of matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3x3 or greater).<br>• N-VM-6: Use matrices to represent and manipulate data.<br>• N-VM-7: Multiply matrices by scalars to produce new matrices.<br>• N-VM-8: Add, subtract, and multiply matrices of appropriate dimensions.<br>• N-VM-9: Understand that, unlike multiplication of numbers, matrix multiplication of square matrices is not a commutative operation, but still satisfies the associative and distributive properties.<br>• N-VM-10: Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.<br>• N-VM-11: Multiply a vector (regarded as a matrix with one column) by a matrix of suitable dimensions to produce another vector. Work with matrices as transformations of vectors.<br>• N-VM-12: Work with 2x2 matrices as transformations of the plane, and interpret the absolute value of the determinant in terms of area. | • What are matrices used for?<br>• How can you find the inverse and determinant of a matrix?<br>• How can you use matrices to perform geometrical transformations ?<br>• How can you use matrices to represent systems of equations?<br>• How do you add, subtract, and multiply matrices?<br>• What is the purpose of learning matrices? | *Students will understand that…*<br>• Matrices can be used to solve systems of linear equations in two or more variables.<br><br>*Students will know…*<br>• Multivariable Linear System<br>• Matrix: Augmented and Coefficient<br>• Row-Echelon Form<br>• Elementary Row Operations<br>• Matrix Addition, Scalar Multiplication, and Matrix Multiplication<br>• Identity Matrix<br>• Square Matrix<br>• Inverse<br>• Determinant<br><br>*Students will be able to…*<br>• Use matrices, back-substitution and elimination to solve systems of linear equations.<br>• Write matrices, identify their orders, and perform elementary row operations on matrices.<br>• Add, subtract, and multiply matrices.<br>• Find inverse of matrices.<br>• Find determinants of square matrices.<br>• Use inverse matrices to solve systems of linear equations.<br>• Use determinants to find areas of triangles.<br>• Use systems of equations and matrices to model and solve real-life problems. HMA only | • Classwork<br>• Homework<br>• Quizzes<br>• Test |

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| *Unit 7*: Analytic Geometry*<br><br>*Larson Sections:* 9.1,9.2,9.3, 9.5-9.8<br><br>*CP:* **4** weeks<br><br>*Honors:* 4 weeks<br><br>***Eccentricity** *Honors Math Analysis Only* | • G-GPE-3: Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant.<br>• G-CO-2: Represent transformations in the plane using, e.g., transparencies and geometric software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not.<br>• F-IF-7: Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. | • What are conic sections?<br>• What are parametric equations used for?<br>• Why is the polar coordinate system studied?<br>• What is the Polar Coordinate System?<br>• How do we determine what the conic represents?<br>• How do you graph curves using the Polar Coordinate System?<br>• How does the concept of distance relate to the concepts of ellipses and hyperbolas? | *Students will understand that…*<br>• Conic sections are curves that result from the intersection of a plane and a cone.<br>• Parametric equations use a third variable to represent a curve in a plane.<br>• Polar coordinates offer a different mathematical perspective on graphing.<br>*Students will know…*<br>• Ellipse<br>• Hyperbolas<br>• Parametric Equations<br>• Polar Coordinate System<br>• Eccentricity *HMA only<br>*Students will be able to…*<br>• Write the standard forms of the equations of basic conics.<br>• Analyze and sketch parabolas, ellipses, and hyperbolas.<br>• Evaluate sets of parametric equations for given values of the parametric and graph curves that are represented by sets of parametric equations.<br>• Rewrite sets of parametric equations as single rectangular equations and find sets of parametric equations for graphs.<br>• Plot points in the polar coordinate system and convert equations from rectangular to polar form and vice versa.<br>• Graph polar equations.<br>• Write conics in terms of eccentricity and write<br>• Conic equations in polar form. | • Classwork<br>• Homework<br>• Quizzes<br>• Test |

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| *Unit **8**:*<br>Limits<br><br>*Supplemental Materials and Larson Sections*:<br>11.1-11.4<br><br>*CP:*<br>4 weeks<br><br>*Honors:*<br>3 weeks | • A-SSE-2: Use the structure of an expression to identify ways to rewrite it.<br>• A-SSE-3: Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity by the expression.<br>• F-IF-5: Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. | • What is a limit?<br>• How do we know if a limit exists?<br>• How do you determine if a function is continuous?<br>• How do you evaluate a limit algebraically?<br>• How do you evaluate a limit using a graph?<br>• How do you evaluate a limit using technology?<br>• What is the importance of the concept of continuity? | *Students will understand that…*<br>• The notion of a limit is a fundamental concept of calculus.<br>• The concept of a limit pertains to approximating the behavior of a function.<br><br>*Students will know…*<br>• Definition of a Limit<br>• Direct Substitution<br>• Dividing Out Technique<br>• Rationalizing Technique<br>• One-Sided Limit<br><br>*Students will be able to…*<br>• Use the definition of a limit to estimate limits.<br>• Determine whether limits of functions exist.<br>• Use properties of limits, dividing out technique, rationalizing technique and direct substitution to evaluate limits.<br>• Approximate limits of functions graphically and numerically.<br>• Evaluate one-sided limits if functions. | • Classwork<br>• Homework<br>• Quizzes<br>• Test |