SCHOOL DISTRICT OF BAYFIELD

9-12 MATHEMATICS CURRICULUM

GRADE	OUTCOMES	BENCHMARKS
Algebra 1	1) Linear and Exponential Functions	1) Understand the difference between linear and exponential functions and know how to solve, interpret and graph for each type of equation using provided data, generated data or graphs. Differentiate different rates of change. Solve interest problems. Understand volume, shape and area of circular figures
	2) Applications of Probability	2) Summarize, represent, and interpret data on a single or multiple variables. Interpret linear models Develop an understanding of random processes underlying statistical experiments Understand independence and conditional probability and use them to interpret data
	3) Creating Equations	3) Create equations that describe numbers or relationships via tables, graphs, and symmetry
	4) Seeing Structure in Expressions	4) Create multiple representations of data in recursive (Now-Next) and explicit forms (Y=)
	5) Reasoning with Equations and Inequalities	5) Understand solving equations as a process of reasoning and explain the reasoning. Solve equations and inequalities in one variable
Algebra 2	1) Inferences and Conclusions from Data	1) Summarize, represent, and interpret data to find center (mean and median) and spread of two or more data sets. Understand and evaluate random processes underlying statistical experiments. Make inferences and justify conclusions from sample surveys, experiments, and observational studies.
	2) Polynomial Functions	2) Use complex numbers in polynomial identities and equations. Interpret the structure of expressions. Derive the formula for the sum of a finite geometric series and use the formula to solve problems. Perform arithmetic operations on polynomials. Understand the relationship between zeros and factors of polynomials. Use polynomial identities to solve problems. Rewrite rational expressions. Solve simple system consisting of linear and quadratic equations in two variables algebraically and graphically. Explain the reasoning why the x-coordinates of intersecting functions are the solutions via tables and graphs of numerous functions including linear, polynomial, rational, absolute value, exponential and logarithmic. Graph polynomial functions, identifying zeroes, when suitable factorizations are available, and showing end behavior.
	3) Rational and Radical Relationships	3) Rewrite rational expressions. Create equations and inequalities in one and two variables, graphing on coordinate axes using correct labels.

		Solve simple rational and radical equations in one variable, and give examples of how extraneous solutions may arise. Explain the reasoning why the x-coordinates of intersecting functions are the solutions via tables and graphs of numerous functions including linear, polynomial, rational, absolute value, exponential and logarithmic. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities. Relate the domain of a function to its graph and to the quantitative relationship it describes. Graph square root, cubed root, and piecewise functions including step functions and absolute value functions. Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. Compare properties of two functions each represented in a different way (algebraic, numeric, and graphic)
	4) Exponential and Logarithms	4) Use the properties of exponents to transform expressions for exponential functions. Graph exponential and logarithmic functions, showing intercepts and end behavior and trigonometric functions showing period, midline, and amplitude. Use the properties of exponents to interpret expressions for exponential functions. Understand the inverse relationship between exponents and logarithms and use the relationship to solve problems involving logarithms and exponents. For exponential models, express as a logarithm the solution to various equations using proper base notations and e as applicable.
	5) Trigonometric Functions	5) Graph exponential and logarithmic functions, showing intercepts and end behavior and trigonometric functions showing period, midline, and amplitude. Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline. Prove Pythagorean identity and use it to find sine, cosine, and tangent given one of the ratios and its determined quadrant.
	6) Mathematical Modeling	6) Create equations that describe numbers or relationships. Interpret functions that arise in applications in terms of the context. Analyze functions using different representations. Write a function that describes a relationship between two quantities utilizing recursive and explicit formulas developed by combining standard function models via composition. Identify the effect on the graph of replacing f(x) by f(x) +k. Solve an equation of the form f(x)=c for a simple function f that has an inverse and write an expression for the inverse. Read values of an inverse function from a graph or a table given that the function has an inverse. Visualize relationships between two dimensional and three dimensional objects. Apply Geometric concepts in modeling situations.
Geometry	1) Congruence	1) Experiment with transformations in the plane. Understand congruence in terms of rigid motions. Prove Geometric Theorems. Make formal geometric constructions with a variety of tools and methods
	2) Understand and apply theorems about circles	2) Identify and describe relationships among inscribed angles, radii, and chords

		Construct a tangent line from a point outside a given circle to the circle. Find arc lengths and area of sectors of circles.
	3) Expressing geometric properties with equations.	3) Use coordinates to prove simple geometric theorems algebraically
	4) Geometric measurement and dimensions 5) Modeling with Geometry	4) Use volume formulas to solve problems. Visualize relationships between two-dimensional and three-dimensional objects. 5) Apply geometric concepts in modeling situations
	6) Similarity, Right Triangles and Trigonometry	6) Understand similarity. Prove theorems involving similarity. Solve problems involving right triangles.
Calculus	1) Quadratic Functions and Modeling	1) Learn how to graph functions including intercepts and max/min points so as to visually represent data and conclusions and to calculate and interpret the average rate of change for a function from and expression and from a graph and to understand which data set has a larger maximum or minimum.
	2) Expressions and Equations	2) Discover ways to rewrite expressions and isolate variables of interests in formulas so as to solve for unknown data components and create and solve equations, inequalities and systems of equations involving exponential and quadratic expressions.
	3) Limits	3) Determine a limit given a graph, explore right handed and left handed limits, determine a limit given an equation and determine infinite limits. Determine the limit at infinity and determine limits at infinity both graphically and numerically
	4) Derivatives	4) Know and understand the concept of the derivative, use the difference quotient to find the slope of the secant line through two points and evaluate the average rate of change. Use the difference quotient to find the slope of the secant line through two points, evaluate the average rate of change and the Tangent line to find the derivative at a given point
	5) Integrals	5) Find the general anti-derivatives of various functions and use differentiation rules to determine anti-derivatives. Integrate a product by inversing the Chain Rule and find the area under a curve using the fundamental theorem of calculus. Use Trigonometric rules to find derivatives and integrals

Pre-Calculus	1) Conics	1) 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.
	2) Trigonometric Functions	2) Produce an invertible function from a non-invertible function by restricting the domain. Find the inverse of a function that presently doesn't have one. Use special triangles to determine geometrically the values of the sine, cosine, and tangent of typical radian measures for π-x, π+x, 2π-x in terms of their values for x. Use the unit circle to explain symmetry (even or odd) and periodicity of trigonometric functions. Understand that restricting a trigonometric function to a domain on which it is always increasing or decreasing allows its inverse to be constructed. Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.
	3) Trigonometry of General Triangles	3) Apply trigonometry to general triangles.
	4) Trigonometric Identities	4) Prove the addition and subtraction formulas for sine, cosine, and tangent and use those to solve problems.
	5) Matrices	5) Perform operations on matrices and use matrices in various applications. Represent a system of linear equations as a single matrix equation in a vector variable. Find the inverse of a matrix if it exists and use it to solve the systems of linear equations.
	6) Vectors	6) Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers. Represent complex numbers and their operations on the complex plane (number system) Represent and Model with vector quantities. Perform operations on vectors. Multiply a vector (regarded as a matrix in one column) by a matrix of suitable dimensions to produce another vector.
	7) Probability	7) Apply the general Multiplication Rule in a probability model and interpret the answer in terms of the model.