



North Polk Community Schools Pacing & Course Description Guide



Grade Level: 9-12

Content: PreCalculus

Year: 2022-2023

Course Description/Rationale

Pre-Calculus is a course designed for students planning on entering AP Calculus. The course is a detailed study of polynomial and rational functions and their graphs, complex numbers and power series, and circular, logarithmic and exponential functions. The students will study analytical geometry and be introduced to calculus through limits. This course is designed for math, engineering, science, construction, and drafting or technology fields. **A graphing calculator is recommended for this class. A TI-84 will be sufficient for this and future math classes.** (1 HS credit)

Name of Unit	Time Frame	Essential Learning Target	Standard(s)
Functions	5 weeks	• Evaluate functions • State the domain and range of functions • Graph functions • Optimize functions • Add, subtract, multiply, divide, and combine functions. • Find the inverse of a function	F-IF Understand the concept of a function and use function notation. 1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$.(F-IF.1.) 2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.(F-IF.2.) F-IF Interpret functions that arise in applications in terms of the context. 5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.(F-IF.5.) 6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.★(F-IF.6.)

			F-IF Analyze functions using different representations. 7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★ Building Functions F-BF Build a function that models a relationship between two quantities. 1b. Combine standard function types using arithmetic operations.(F-BF.1.) 1c. (+) Compose functions.(F-BF.1.) F-BF Build new functions from existing functions. 3. Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.(F-BF.3.) 4. Find inverse functions. 4b. (+) Verify by composition that one function is the inverse of another.(F-BF.4.) 4c. (+) Read values of an inverse function from a graph or a table, given that the function has an inverse.(F-BF.4.) 4d. (+) Produce an invertible function from a non-invertible function by restricting the domain.(F-BF.4.)
Polynomials	4 weeks	- Find all real zeros to a polynomial - Find all zeros to a polynomial - Sketch the graph of a rational function	1. Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.(A- APR.1.) (Essential Standard Algebra 1, Algebra

			2) A-APR Understand the relationship between zeros and factors of polynomials. 2. Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $x - a$ is $p(a)$, so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$.(A-APR.2.) 3. Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.(A-APR.3.) A-APR Rewrite rational expressions. 6. Rewrite simple rational expressions in different forms; write $\frac{a(x)}{b(x)}$ in the form $q(x) + \frac{r(x)}{b(x)}$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system.(A-APR.6.) IA: HS: Functions Interpreting Functions F-IF Analyze functions using different representations. 7c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.(F-IF.7.)
Exponential and Logarithmic Functions	4 weeks	- Sketch the graphs of exponential and logarithmic functions. - Evaluate logarithms - Solve exponential and logarithmic equations	Creating Equations A-CED Create equations that describe numbers or relationships. 1. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.(A-CED.1.) (Essential Standard Algebra 1, Algebra 2)

			Reasoning with Equations & Inequalities A-RE I Represent and solve equations and inequalities graphically. 11. Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.★(A-REI.11.) IA: HS: Functions Interpreting Functions F-IF Analyze functions using different representations. 7e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.(F-IF.7.) 8b. Use the properties of exponents to interpret expressions for exponential functions.(F-IF.8.) Building Functions F-BF Build new functions from existing functions. 5. (+) Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.(F-BF.5.) Linear, Quadratic, and Exponential Models F-LE Construct and compare linear and exponential models and solve problems.
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			4. For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where a , c , and d are numbers and the base b is 2, 10, or e ; evaluate the logarithm using technology.(F-LE.4.)
Limits and Derivatives	3 weeks	- Find the limit of a function - Find the derivative of a function	Interpret functions that arise in applications in terms of the context (F-IF.B) 4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.★ (F-IF.B.4)