

Course: PreCalculus **Grade:** 11-12 **Unit Name:** Functions and Graphs

Essential Questions/ Focus Questions:

- How do we model data?
- How do we analyze functions?
- How to identify: domain, range, extrema, continuity, symmetry, asymptotes, end behavior, boundedness of a function and its graph?
- What are the twelve basic functions?
- How do we combine functions algebraically?
- How does finding the composite of a function differ from combining?
- How are transformations defined in a function and on a graph?
- How can we model a real world situation with a function?
- How do we identify a function both algebraically and graphically?

Suggested Time Frame: approximately fifteen 60 minute class periods.

Michigan Merit Content Expectations:

- P1.1 Know and use a definition of a function to decide if a given relation is a function.
- P1.2 Perform algebraic operations (including compositions) on functions and apply transformations (translations, reflections, and rescalings).
- P1.3 Write an expression for the composition of one given function with another and find the domain, range, and graph of the composite function. Recognize components when a function is composed of two or more elementary functions.
- P1.6 Identify and describe discontinuities of a function (e.g., greatest integer function, $1/x$) and how these relate to the graph.
- P1.7 Understand the concept of limit of a function as x approaches a number or infinity. Use the idea of limit to analyze a graph as it approaches an asymptote. Compute limits of simple functions (e.g., find the limit as x approaches 0 of $f(x) = 1/x$) informally.
- P1.8 Explain how the rates of change of functions in different families (e.g., linear functions, exponential functions, etc.) differ, referring to graphical representations.

Materials Used: (textbooks, websites, videos, etc...)

- Demana Waits Foley Kennedy Precalculus - Graphical, Numerical, Algebraic, TI Calculators(TI 83, TI 84)

Major Themes/ Concepts:

- Graphical Transformations
- Building Functions from Functions
- Modeling
- Properties of Functions

Assessments:

- Unit Test

Course: PreCalculus Grade: 11-12 Unit Name: Polynomial, Power, and Rational Functions

Essential Questions/ Focus Questions:

- How do we interpret linear correlation in regard to modeling?
- How do you identify a power functions graph and equation?
- How do you find the zeros of a polynomial function?
- What patterns can we see with the end behavior of polynomial functions?
- How is synthetic division similar to polynomial long division?
- What are the limitations of synthetic division?
- How do extraneous solutions occur when solving equations in one variable?
- How do you solve equations and inequalities involving polynomials and rational functions?

Suggested Time Frame: Approximately 20 sixty minute class periods

Michigan Merit Content Expectations:

- P1.2 Perform algebraic operations (including compositions) on functions and apply transformations (translations, reflections, and rescalings).
- P1.6 Identify and describe discontinuities of a function and how these relate to the graph.
- P1.7 Understand the concept of limit of a function as x approaches a number or infinity. Use the idea of limit to analyze a graph as it approaches an asymptote. Compute limits of simple functions (e.g., find the limit as x approaches 0 of $f(x) = 1/x$) informally.
- P3.2 Apply quadratic functions and their graphs in the context of motion under gravity and simple optimization problems.
- P3.3 Explain how the parameters of an exponential or logarithmic model relate to the data set or situation being modeled. Find a quadratic function to model a given data set or situation.
- P4.2 Solve polynomial equations and inequalities of degree greater than or equal to three. Graph polynomial functions given in factored form using zeros and their multiplicities, testing the sign on intervals and analyzing the function's large-scale behavior.
- P4.3 Know and apply fundamental facts about polynomials: the Remainder Theorem, the Factor Theorem, and the Fundamental Theorem of Algebra.
- P5.1 Solve equations and inequalities involving rational functions. Graph rational functions given in factored form using zeros, identifying asymptotes, analyzing their behavior for large x values, and testing intervals.
- P5.2 Given vertical and horizontal asymptotes, find an expression for a rational function with these features.

Materials Used: (textbooks, websites, videos, etc...)

Demana Waits Foley Kennedy Precalculus - Graphical, Numerical, Algebraic, TI Calculators(TI 83, TI 84)

Major Themes/ Concepts:

- Modeling Linear, Quadratic, Polynomial, and Power functions
- Finding real and complex zeros of polynomial functions
- Solving equations and inequalities
- Graphs of rational functions
- Polynomial and synthetic division

Assessments:

- Unit Test