

# Precalculus Algebra

## MOTR Math 130

*Precalculus Algebra* is intended to prepare students for fields of study that would require a high level of algebraic reasoning or Calculus. Topics include the foundational principles of functions, the analysis of functions and algebraic reasoning.

<b>I</b>	<b>Foundation of Functions</b>	
Students will use multiple representations of different function types to investigate quantities and describe relationships between quantities. Specifically, students will be able to:		
I.A	Use multiple representations of functions to interpret and describe properties of functions.	
	I.A.1	Effectively communicate using function notation.
	I.A.2	Identify the following functions: linear, quadratic exponential, logarithmic, rational, radical, polynomial, piecewise and absolute value given the graph or the equation.
	I.A.3	Identify domains and ranges in multiple contexts.
	I.A.4	Identify from the graph the local maximums and minimums.
	I.A.5	Determine whether a graph has symmetry and whether a function is even or odd.
I.B	Use multiple representations of functions to describe how two quantities change together.	
	I.B.1	Determine intervals on which a function is increasing, decreasing and constant.
	I.B.2	Identify constant rates of change.
	I.B.3	Determine average rates of change.
	I.B.4	Simplify the difference quotient of various types of functions.
<b>II</b>	<b>Analysis of Functions</b>	
Students will describe characteristics of different function types and convert between different representations and algebraic forms to analyze and solve meaningful problems. Specifically, students will be able to:		
II.A	Create, use and interpret linear equations and convert between forms as appropriate.	
	II.A.1	Identify important values (i.e. slope and intercepts) from multiple representations.
	II.A.2	Determine equations of lines.
II.B	Create, use and interpret exponential and logarithmic equations and convert between forms as appropriate.	
	II.B.1	Apply the inverse relationship between exponential and logarithmic functions.
	II.B.2	Graph exponential and logarithmic functions.
	II.B.3	Recognize similarities and differences between linear and exponential functions.
	II.B.4	Solve applications involving base $e$ .
	II.B.5	Interpret half-life and doubling time to create decay and growth models.
	II.B.6	Describe long term behavior of exponential models.
II.C	Create, graph, apply and interpret polynomial, power and rational functions.	
	II.C.1	Find roots, determine end behavior and graph polynomial functions.
	II.C.2	Graph rational functions and find vertical, horizontal and oblique asymptotes.
II.D	Construct, use and describe transformations, operations, compositions and inverses of functions.	
	II.D.1	Describe how the graph of a function can be the result of vertical and horizontal shifts, stretches, compressions and reflections of the graph of a basic function.
	II.D.2	Perform arithmetic operations with functions and describe the domain.
	II.D.3	Create new functions by composing basic functions and describe the domain.
	II.D.4	Decompose a composite function into basic functions.
	II.D.5	Determine if a function is one-to-one, and if so, find the inverse and describe its domain and range.

III	<b>Algebraic Reasoning</b> Students will identify and apply algebraic reasoning to write equivalent expressions, solve equations and solve inequalities. Specifically, students will be able to:	
	III.A	Use algebraic techniques to simplify and expand expressions.
	III.A.1	Apply properties to exponents and logarithms.
	III.A.2	Simplify and factor expressions involving rational exponents.
	III.B Use algebraic reasoning to solve equations.	
	III.B.1	Solve quadratic equations by factoring, the square root property, completing the square and the quadratic formula.
	III.B.2	Solve polynomial, radical, rational, exponential and logarithmic equations.
	III.B.3	Determine complex roots of polynomials.
	III.B.4	Solve equations using rational exponents.
	III.B.5	Solve and apply systems of linear and non-linear equations.
	III.B.6	Solve quadratic, absolute value, polynomial and rational inequalities.