Teacher: CORE
PreCalc Year: 2017-18
Course: Month: All
PreCalc Months

S	Prerequisites							
e	Essential Questions	Content	Knowledge and Skills	Vocabulary	Assessments	Lessons	Resources	Standards
p		Real Numbers	Order real numbers, use inequalities, evaluate algebraic expressions		Quiz: P1 - P2 Assessment of learning			2.1.11.A-Use operations (e.g., opposite, reciprocal, absolute value, raising to a power, finding roots, finding logarithms).
t					Quiz: P3 - P4 Performance Assessment			2.2.11.A-Develop and use computation concepts, operations and procedures with real numbers in problem-solving situations.
e					Quiz: P5 - P6 Performance Assessment			2.2.11.C-Construct and apply mathematical models, including lines and curves of best fit, to estimate values of related quantities.
m					Test: P1 - P8 Performance Assessment			
b		Exponents and Radicals	Apply properties of exponents					
e								
r			Apply properties of radicals					
		Polynomials and Factoring	Add, subtract, and multiply polynomials					
			Factor polynomials					
		Rational expressions	Add, subtract, multiply and divide rational expressions					
		Solving Equations	Solve polynomial equations, equations involving radicals, and abslolute value equations					
		Solving Inequalities	Solve inequalities					
		Graphical representation of data	Use the coordinate plane to model and solve real-life problems					
O	Functions and Graphing							

c	Essential Questions	Content	Knowledge and Skills	Vocabulary	Assessments	Lessons	Resources	Standards
t		Graphs of equations	Sketch the graph of an equation using a table of values, intercepts and symmetry		Quiz: 1.2 - 1.3 Performance Assessment			2.8.11.A-Analyze a given set of data for the existence of a pattern and represent the pattern algebraically and graphically.
o			Graph equations using a graphing calculator		Quiz 1.4 - 1.5			2.8.11.Q-Represent functional relationships in tables, charts and graphs.
b					Quiz 1.6 - 1.8			2.8.11.S-Analyze properties and relationships of functions (e.g., linear, polynomial, rational, trigonometric, exponential, logarithmic).
e					Test 1.1 - 1.8			2.8.11.T-Analyze and categorize functions by their characteristics.
r		Lines	Find and use the slopes of lines to write and graph linear equations in two variables					2.8.11.K-Select, justify and apply an appropriate technique to graph a linear function in two variables, including slope-intercept, x- and y-intercepts, graphing by transformations and the use of a graphing calculator.
			Determine whether lines are parallel or perpendicular using slope					2.8.11.L-Write the equation of a line when given the graph of the line, two points on the line, or the slope of the line and a point on the line.
			Solve problems using linear equations Interpret slope as a rate of change					2.8.11.M-Given a set of data points, write an equation for a line of best fit. M11.D.3.1-Describe and/or determine change. (Reference: 2.8.8.J, 2.11.8.B) M11.D.3.2-Compute and/or use the slope of a line. (Reference: 2.8.11.J, 2.8.11.L)
		Functions	Evaluate functions and find their domain and range					2.8.11.O-Determine the domain and range of a relation, given a graph or set of ordered pairs.
			Evaluate difference quotients					2.8.11.Q-Represent functional relationships in tables, charts and graphs. 2.8.11.R-Create and interpret functional models. 2.8.11.S-Analyze properties and relationships of functions (e.g., linear, polynomial, rational, trigonometric, exponential, logarithmic). 2.8.11.T-Analyze and categorize functions by their characteristics.

		M11.D.1.1-Analyze and/or use patterns or relations. (Reference: 2.8.11.Q; 2.8.11.A; 2.8.11.0)
Graphs of Functions	Analyze graphs of functions including step functions, piecewise functions, and even and odd functions Determine domain and range, intervals of increase and decrease, zeros, and maxima and minima Use the vertical line test for functions	2.2.12.A-Determine and explain the meaning of the zeros of functions model from real life situations. 2.8.11.A-Analyze a given set of data for the existence of a pattern and represent the pattern algebraically and graphically. 2.8.11.O-Determine the domain and range of a relation, given a graph or set of ordered pairs. 2.8.11.Q-Represent functional relationships in tables, charts and graphs. 2.8.11.T-Analyze and categorize functions by their characteristics. 2.8.12.K-Create, write, and solve real life problems that demonstrate an understanding of appropriate function models. 2.11.11.A-Determine maximum and minimum values of a function over a specified interval. 2.11.11.B-Interpret maximum and minimum values in problem situations. 2.11.12.B-Describe the meaning of maximum or minimum values of a function and how it applies to a real life situation. M11.D.1.1-Analyze and/or use patterns or relations. (Reference: 2.8.11.Q; 2.8.11.A; 2.8.11.0)
Transformations of Graphs	Identify and graph translations, reflections, and non-rigid transformations of functions Describe transformations from a graph and from the function equation	2.8.11.A-Analyze a given set of data for the existence of a pattern and represent the pattern algebraically and graphically. 2.8.11.Q-Represent functional relationships in tables, charts and graphs. 2.8.11.T-Analyze and categorize functions by their characteristics.

	Operations on Functions	Find arithmetic combinations and compositions of functions Decompose a function					2.8.11.S-Analyze properties and relationships of functions (e.g., linear, polynomial, rational, trigonometric, exponential, logarithmic). M11.D.2.2-Simplify expressions involving polynomials. (Reference: 2.8.11.S)
	Inverse Functions	Find the inverse of a function graphically and algebraically Determine the domain and range of a function and its inverse					2.8.11.A-Analyze a given set of data for the existence of a pattern and represent the pattern algebraically and graphically. 2.8.11.O-Determine the domain and range of a relation, given a graph or set of ordered pairs. 2.8.11.Q-Represent functional relationships in tables, charts and graphs. M11.D.1.1-Analyze and/or use patterns or relations. (Reference: 2.8.11.Q; 2.8.11.A; 2.8.11.0)
	Direct, Inverse, and Joint Variation	Write and apply algebraic models for direct, inverse, and joint variation Solve problems from science (Chemistry and Physics) using direct or inverse variation					2.8.11.A-Analyze a given set of data for the existence of a pattern and represent the pattern algebraically and graphically. 2.8.11.B-Give examples of patterns that occur in data from other disciplines. 2.8.11.P-Analyze a relation to determine whether a direct or inverse variation exists and represent it algebraically and graphically. 2.8.12.J-Solve problems involving direct, inverse and joint variation. 2.8.12.K-Create, write, and solve real life problems that demonstrate an understanding of appropriate function models. M11.A.2.1-Apply ratio and/or proportion in problem-solving situations. (Reference: 2.2.11.A, 2.8.11.P)
N	Polynomial Functions						
o	Essential Questions	Content	Knowledge and Skills	Vocabulary	Assessments	Lessons Resources	Standards
v		Quadratic functions	Analyze equations and graphs of quadrtic functions to determine the vertex, axis of symmetry, and intercepts		QUIZ: 2.1 - 2.3		2.8.11.A-Analyze a given set of data for the existence of a pattern and represent the pattern algebraically and graphically.

e			QUIZ: 2.4 - 2.7	2.8.11.N-Solve linear, quadratic and exponential equations both symbolically and graphically.
m			TEST: 2.1 - 2.7	2.8.11.S-Analyze properties and relationships of functions (e.g., linear, polynomial, rational, trigonometric, exponential, logarithmic).
b		Write quadratic functions in standard form and determine characteristics of the graph		2.11.11.A-Determine maximum and minimum values of a function over a specified interval.
e		Solve problems involving quadratic functions and maxima and minima		2.11.12.B-Describe the meaning of maximum or minimum values of a function and how it applies to a real life situation.
r				M11.D.4.1-Interpret and/or use linear, quadratic and/or exponential functions and their equations, graphs or tables. (Reference: 2.8.11.K, 2.8.11.Q,)
	Polynomial functions	Define polynomial functions and graph polynomial functions using the leading coefficient test		2.8.11.A-Analyze a given set of data for the existence of a pattern and represent the pattern algebraically and graphically.
				2.8.11.Q-Represent functional relationships in tables, charts and graphs.
				2.8.11.T-Analyze and categorize functions by their characteristics.
		Graph transformations of polynomial functions		2.8.12.I-Collect and model real life data using polynomial functions, exponential and power functions.
		Define continuity		
	Polynomial division	Determine the quotient of polynomials using division and synthetic division		2.8.11.S-Analyze properties and relationships of functions (e.g., linear, polynomial, rational, trigonometric, exponential, logarithmic).
		Use the Remainder and Factor Theorems		M11.D.2.2-Simplify expressions involving polynomials. (Reference: 2.8.11.S)
	Zeros of Polynomial Functions	Perform operations with complex numbers		2.2.12.A-Determine and explain the meaning of the zeros of functions model from real life situations.
		Determine the number of rational and real zeros of polynomial functions, and find the zeros using factoring and the graphing calculator		

Rational Functions

Essential Questions	Content	Knowledge and Skills	Vocabulary	Assessments	Lessons	Resources	Standards
	Rational Functions and Asymptotes	Determine the domain and range of rational functions Define rational functions and horizontal and vertical asymptotes					2.8.11.A-Analyze a given set of data for the existence of a pattern and represent the pattern algebraically and graphically. 2.8.11.O-Determine the domain and range of a relation, given a graph or set of ordered pairs. 2.8.11.Q-Represent functional relationships in tables, charts and graphs. M11.D.1.1-Analyze and/or use patterns or relations. (Reference: 2.8.11.Q; 2.8.11.A; 2.8.11.O)
	Graphs of Rational Functions	Analyze and sketch the graphs of rational functions Find vertical and horizontal asymptotes					2.8.11.A-Analyze a given set of data for the existence of a pattern and represent the pattern algebraically and graphically. 2.8.11.Q-Represent functional relationships in tables, charts and graphs. M11.D.1.1-Analyze and/or use patterns or relations. (Reference: 2.8.11.Q; 2.8.11.A; 2.8.11.O)
	Partial Fractions	Find partial fraction decomposition of rational expressions					2.2.11.A-Develop and use computation concepts, operations and procedures with real numbers in problem-solving situations. M11.A.2.1-Apply ratio and/or proportion in problem-solving situations. (Reference: 2.2.11.A, 2.8.11.P) M11.A.3.1-Apply the order of operations in computation and in problem-solving situations. (Reference: 2.2.8.A)

D Exponential and Logarithmic Functions

e

Essential Questions	Content	Knowledge and Skills	Vocabulary	Assessments	Lessons	Resources	Standards
c	Exponential Functions and their graphs	Define, evaluate, and graph exponential functions with base a		Quiz: 3.1 - 3.3			2.1.11.A-Use operations (e.g., opposite, reciprocal, absolute value, raising to a power, finding roots, finding logarithms).

e			Define, evaluate, and graph the natural exponential function		Quiz: 3.4 - 3.5			2.8.11.N-Solve linear, quadratic and exponential equations both symbolically and graphically.
m					Test: 3.1 - 3.5			2.8.11.Q-Represent functional relationships in tables, charts and graphs.
b								2.8.11.S-Analyze properties and relationships of functions (e.g., linear, polynomial, rational, trigonometric, exponential, logarithmic).
e								2.8.11.T-Analyze and categorize functions by their characteristics.
r		Logarithmic Functions and their Graphs	Define, graph and evaluate logarithmic functions with base a					2.1.11.A-Use operations (e.g., opposite, reciprocal, absolute value, raising to a power, finding roots, finding logarithms).
			Define, graph, and evaluate the natural logarithmic function					2.8.11.N-Solve linear, quadratic and exponential equations both symbolically and graphically.
								2.8.11.S-Analyze properties and relationships of functions (e.g., linear, polynomial, rational, trigonometric, exponential, logarithmic).
		Properties of logarithms	Use the properties of logarithms to evaluate, expand, and condense logarithmic expressions					2.1.11.A-Use operations (e.g., opposite, reciprocal, absolute value, raising to a power, finding roots, finding logarithms).
		Exponential and logarithmic equations	Solve exponential and logarithmic equations					2.1.11.A-Use operations (e.g., opposite, reciprocal, absolute value, raising to a power, finding roots, finding logarithms).
		Exponential and logarithmic models	Use exponential growth and decay, logistic growth, and logarithmic models to solve problems					2.8.11.R-Create and interpret functional models.
								2.11.11.C-Graph and interpret rates of growth/decay.
J	Trigonometry							
a	Essential Questions	Content	Knowledge and Skills	Vocabulary	Assessments	Lessons	Resources	Standards
n		Angle measiures in degrees and radians	Define and use radian and degree measure of angles		Quiz: 4.1 - Performance Assessment			2.3.11.B-Measure and compare angles in degrees and radians.
u			Convert angle measures using degrees and radians		Quiz: 4.2 Assessment of learning			M11.B.2.1-Use and/or compare measurements of angles. (Reference: 2.3.11.a, 2.3.11.B)
a					Test: 4.1 - 4.4 Assessment of learning			

r					Quiz: 4.5 - 4.6 Assessment of learning			
y					Test: 4.5 - 4.8 Assessment of learning			
		Right triangle trigonometry	Review right triangle definitions of trig functions and trig ratios in special right triangles Solve application problems involving right triangle trig					2.10.11.B-Identify, create and solve practical problems involving right triangles using the trigonometric functions and the Pythagorean Theorem.
		Trigonometric Functions	Evaluate trig functions using the unit circle and reference angles					2.10.11.B-Identify, create and solve practical problems involving right triangles using the trigonometric functions and the Pythagorean Theorem.
		Graphs of Trig Functions	Graph the sine, cosine, tangent, cosecant, secant, and cotangent functions Graph translations of the sine and cosine functions					
		Inverse Trig Functions	Define, evaluate, and graph inverse trig functions Evaluate compositions of inverse trig functions					
F	Trigonometric Identities and Formulas							
e	Essential Questions	Content	Knowledge and Skills	Vocabulary	Assessments	Lessons	Resources	Standards
b		Trig Identities	Review fundamental trig identities to evaluate trig functions and simplify trig expressions.		Quiz 5.1 - 5.2 Assessment of Learning			2.5.11.C-Present mathematical procedures and results clearly, systematically, succinctly and correctly.
r					Quiz: 5.3 - 5.5 Assessment of learning			
u			Verify trig identities		Test: 5.1 - 5.5 Assessment of Learning			
a		Trig Equations	Solve trig equations using algebra techniques and inverse trig functions					
r		Sum and Difference	Derive sum and difference formulas					

y		formulas	Evaluate trig functions and solve trig equations using these formulas					
		Multiple angle and product sum formulas	Simplify and evaluate trig expressions using multiple angle and product sum formulas					
M	Applications of Trigonometry							
a	Essential Questions	Content	Knowledge and Skills	Vocabulary	Assessments	Lessons	Resources	Standards
r		Law of Sines	Solve triangles using the Law of Sines		Quiz: 6.1 - 6.2 Assessment of Learning			2.2.11.C-Construct and apply mathematical models, including lines and curves of best fit, to estimate values of related quantities.
c			Find the area of triangles		Quiz: 6.3 - 6.5 Assessment of Learning			2.3.11.B-Measure and compare angles in degrees and radians.
h					Test: 6.1 - 6.5 Assessment of Learning			2.4.11.C-Determine the validity of an argument. 2.4.11.E-Demonstrate mathematical solutions to problems (e.g., in the physical sciences). 2.5.11.A-Select and use appropriate mathematical concepts and techniques from different areas of mathematics and apply them to solving non-routine and multi-step problems.
		Law of Cosines	Solve triangles using the Law of Cosines					
		Vectors	Write the component form of vectors and perform vector operations Represent vectors as directed line segments and as rays on the coordinate plane Define and apply vector addition and scalar multiplication Find the direction angle of vectors Solve application problems using vectors					

A Sequences and Series

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Essential Questions	Content	Knowledge and Skills	Vocabulary	Assessments	Lessons	Resources	Standards
	Sequences and Series	Use sequence, factorial, and summation notation to write the terms and sum of a sequence		Quiz: 9.1 - 9.3 Assessment of learning Quiz: 9.4 - 9.7 Assessment of learning Test: 9.1 - 9.7 Assessment of learning			2.4.11.B-Construct valid arguments from stated facts. 2.4.11.E-Demonstrate mathematical solutions to problems (e.g., in the physical sciences). 2.5.11.A-Select and use appropriate mathematical concepts and techniques from different areas of mathematics and apply them to solving non-routine and multi-step problems. 2.5.11.B-Use symbols, mathematical terminology, standard notation, mathematical rules, graphing and other types of mathematical representations to communicate observations, predictions, concepts, procedures, generalizations, ideas and results. 2.5.11.C-Present mathematical procedures and results clearly, systematically, succinctly and correctly. 2.7.11.A-Compare odds and probability. 2.7.11.D-Use experimental and theoretical probability distributions to make judgments about the likelihood of various outcomes in uncertain situations. 2.7.11.E-Solve problems involving independent simple and compound events.
	Arithmetic sequences	Solve problems involving arithmetic sequences and series					
	Geometric sequences	Solve problems involving geometric sequences and series					
	Mathematical induction	Use mathematical induction to prove a statement					
	Binomial Theorem	Use binomial throrem and Pascal's triangle to calculate binomial coefficients					

		Counting	Solve counting problems using Fundamental Counting Principle permutations and combinations					
		Probability	Find probabilities of mutually exclusive events, independent events and complements of events					
M	Systems of Equations and Matrices & Determinants							
a	Essential Questions	Content	Knowledge and Skills	Vocabulary	Assessments	Lessons	Resources	Standards
y		Solving systems of equations	To solve systems of equations by substitution, elimination and graphing		Quiz: 7.1 - 7.2			2.2.11.F-Demonstrate skills for using computer spreadsheets and scientific and graphing calculators.
					Quiz: 7.3 - 7.4			2.5.11.A-Select and use appropriate mathematical concepts and techniques from different areas of mathematics and apply them to solving non-routine and multi-step problems.
					Test: 7.1 - 7.4 Assessment of learning			2.5.11.C-Present mathematical procedures and results clearly, systematically, succinctly and correctly.
		Multivariable linear systems	Solve multivariable systems of equations					
		Solving Systems of Inequalities	Graph inequalities in two variables and solve systems of inequalities					
		Operations with Matrices	Add and subtract matrices		Quiz: 8.1 - 8.2 Assessment of learning			
			Multiply matrices by real numbers		Quiz: 8.3 - 8.5 Assessment of learning			
			Find the product of two matrices		Test: 8.1 - 8.5 Assessment of learning			
		Inverse Matrices	Find the inverse of a matrix and use inverse matrices to solve systems of equations					
		Determinants	Find determinants of a 2x2 matrix					

			Use Cramer's Rule to solve systems of equations						
			Use determinants and matrices to solve problems involving area of a triangle						
J	Analytic Geometry								
u	Essential Questions	Content	Knowledge and Skills	Vocabulary	Assessments		Lessons	Resources	Standards
n		Conics	Define and describe circles, parabolas, ellipses, and hyperbolas						
e			Write equations of conics						
			Graph conics						
		Transformation of Conics	Write and graph equations of conics with vertical or horizontal translations						
		Parametric Equations	Evaluate, graph and write parametric equations						