Pre-Calculus and Trigonometry Capacity Matrix

Purpose and Vision		Understanding and Applying Pre-Calculus and Trigonometry	Information	Knowledge	Know-how	wisdom	Portfolio
Unit	**Standard**	**Capacity Breakdown**					
Review Polynomials	A1.1.4	Add, subtract, multiply and simplify polynomials and rational expressions	X	x			Shot in the Dark, Robotics 101
	A1.2.5	Solve polynomial equations and equations involving rational expressions	X	x			Shot in the Dark
Unit	**Standard**	**Capacity Breakdown**					
Review Chapter 1	Sec 1.5	Use interval notation	X				
	Sec 1.5	Solve and use properties of inequalities	X				
	Sec 1.6	Solve equations involving Absolute Value	X				
	Sec 1.6	Solve Inequalities involving Absolute Value	X				
	Sec 1.7	Verbal descriptions into mathematical expressions	X	x			Shot in the Dark, The Unit Circle
	Sec 1.7	Solve interest problems, uniform motion problems, mixture problems and constant rate job problems	X				
Unit	**Standard**	**Capacity Breakdown**					
Functions and their Graphs Chapter 3	P1.1	Know and use a definition of a function to decide if a given relation is a function	X	x			Shot in the Dark
	P1.2	Perform algebraic operations (including compositions) on functions and apply transformations(translations, reflections and rescaling)	X	x			Shot in the Dark
	P1.6	Identify and describe discontinuities of a function(greatest integer function) and how these relate to the graph	X				
	P5.3	Know and apply the definition and geometric interpretation of the difference quotient	X	x			Shot in the Dark
	P5.3	Simplify difference quotients and interpret them as rates of change and slopes of secant lines	X	x			Shot in the Dark

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	Sec 3.6	Translate written description of a real world problem into a mathematical model	X	x			Shot in the Dark
	Sec 3.6	Assign independent and dependent variables Be able to find minimum or maximum value in a real world problem	x	x			Shot in the Dark
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Unit	**Standard**	**Capacity Breakdown**					
Linear and Quadratic Functions Chapter 4	P1.1	Know and use a definition of a function to decide if a given relation is a function	X				
	P1.2	Perform algebraic operations on functions and apply transformations(translations, reflections, and rescaling)	X				
	P1.8	Explain how the rates of change of functions in different families (ex. Linear functions and quadratics) differ, referring to graphical representations	x	x			Shot in the Dark
	P3.2	Apply quadratic functions and their graphs in context of motion under gravity and simple optimization problems	X	x			Shot in the Dark
	P3.3	find a quadratic function to model a given data set or situation	x	x			Shot in the Dark
	Sec 4.4	Solve applied problems involving the law of demand using the demand equation					
Polynomials and Rational Functions Chapter 5	P4.1	Given a polynomial function whose roots are known or can be calculated, find the intervals on which the function's value are positive and those where it is negative					
	P4.2	Solve polynomial equations and inequalities of degree greater than or equal to three. Graph the polynomial functions given in factored form using zeros and their					

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		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					
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Unit	**Standard**	**Capacity Breakdown**					
Polynomials and Rational Functions Chapter 5	P5.1	Solve equations and inequalities involving rational functions. Graph rational functions given 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 functions.					
Unit	**Standard**	**Capacity Breakdown**					
Exponential and Logarithmic Functions Chapter 6	P1.2	Know and use a definition of a function to decide if a given relation is a function.					
	P1.3	Write an expression for the composition of one given function with another and find domain, range and graph of the composite function. Recognize components when a function is composed of two or more elementary functions.					
	P1.4	Determine whether a function (given symbolically or graphically) has an inverse and express the inverse if it exists. Know and interpret the function notation for inverses					
	P1.5	Determine whether two given functions are inverses, using composition.					
	P2.1	Use the inverse relationship between exponential and logarithmic functions to solve equations and problems.					Robotics 101
	P2.2	Graph logarithmic functions. Graph translations and reflections of these functions					
	P2.3	Solve exponential and logarithmic equations. For those that cannot be solved analytically, use graphical methods to find approximate solutions.					

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	P2.4	Solve exponential and logarithmic equations when possible. For those that cannot be solved analytically, use graphical methods to find approximate solution.					
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Unit	**Standard**	**Capacity Breakdown**					
Exponential and Logarithmic functions Chapter 6	P2.5	Explain how the parameters of an exponential or logarithmic model relate to the data set or situation being modeled. Find an exponential or logarithmic function to model a given data set or situation. Solve problems involving exponential growth and decay.					
	P3.1	Solve quadratic-type equations by substitution(eg. $e^{2x} - 4e^{x+4} = 0$)					
	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 given data or situation.					
Unit	**Standard**	**Capacity Breakdown**					
Trigonometric Functions Chapter 7	P6.1	Define using the unit circle, graph and use all trigonometric functions of any angle. Convert between radian and degree measure. Calculate arc length, and area of a sector in a given circle.	X	x			The Unit Circle
	P6.2	Graph transformations of the sine and cosine functions (involving changes in amplitude, period, midline and phase changes) and explain the relationship between constraints in the formula and transformed graph.	X				
	Sec 7.7	Graph transformations of tangent functions	X				

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	P6.6	Prove trigonometric identities and derive some of the basic ones. Know the fundamental identities.	X	x			The Unit Circle, Robotics 101
	P6.7	Find a sinusoidal function to model a given data set or situation and explain how the parameters of the model relate to the data set or situation.	x				
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Analytic Trigonometry Chapter 8	P6.3	Know the basic properties of the inverse trigonometric functions: $\sin^{-1}x$, $\cos^{-1}x$, $\tan^{-1}x$, including their domains and ranges. Recognize their graphs.					Robotics 101
	P6.4	Know basic trigonometric identities for sine cosine and tangent (Fundamental, sum and difference, co functions, double and half angle formulas)	X	x			The Unit Circle, Robotics 101
	P6.6	Prove trigonometric identities and derive some of the basic ones (double angle formulas from sum and difference formulas, half angles formula from double angle formula)	x				Robotics 101
	P6.5	Solve trigonometric equation using basic identities and inverse trigonometric functions					
	CCSS	Prove the addition and subtraction formula for sine, cosine, and tangent and use them to solve problems.					
Unit	**Standard**	**Capacity Breakdown**					
Miscellaneous	Application of Trigonometric Functions	Real world applications of problems involving trigonometry such as the laws of sine and cosine.	x				Robotics 101
Unit	**Standard**	**Capacity Breakdown**					
Polar Coordinates	P9.1	Convert between polar and rectangular coordinates. Graph functions given in polar coordinates					

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Chapter 10	P9.2	Write complex numbers in polar form. Know and use De Moivre's Theorem					
	P9.3	Evaluate parametric equations for given values of parameter					
	P9.4	Convert between parametric and rectangular forms of equations					
Purpose and Vision		**Understanding and Applying Pre-Calculus and Trigonometry**	**Information**	**Knowledge**	**Know-how**	**wisdom**	**Portfolio**
Polar Coordinates Chapter 10	P9.5	Graph curves described by parametric equation and find parametric equations for a given graph					
	P9.6	Use parametric equations in applied contexts to model situations and solve problems					
	CCSS	Represent complex numbers on the complex plane in rectangular and polar form (including real and imaginary numbers), and explain why the rectangular and polar forms of a given complex number represent the same number.					
Unit	**Standard**	**Capacity Breakdown**					
Vectors, Matrices, and Systems of Equations Chapter 12	P7.1	Perform operations (addition, subtraction, and multiplication by scalars) on vectors in the plane. Solve applied problems using vectors.	X				
	P7.2	Know and apply the algebraic and geometric definitions of the dot product using vectors					
	P7.3	Know the definitions of matrix addition and multiplication. Add, subtract, and multiply matrices. Multiply a vector by a matrix.	X				
	P7.5	Define the inverse of a matrix and compute the inverse of two-by-two and three-by-three matrices when they exist	X				
	P7.6	Explain the role of determinants in solving systems of linear equation using matrices and compute determinants of two-by-two and three-by-three matrices. Use Crammer's Rule	X				Robotics 101

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	P7.7	Write systems of two and three equations in matrix form. Solve such systems using Gaussian elimination or inverse matrices.	X				
	P7.8	Represent and solve systems of inequalities in two variable and apply these methods in linear programming situations to solve problems					
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Sequences, Series and Math Induction Chapter 13	P8.1	Know, explain and use sigma and factorial notation					
	P8.2	Given arithmetic, geometric, or recursively defined sequence, write an expression for the nth term when possible. Write a particular term of a sequence when given the nth term.					
	P8.3	Understand, explain and use the formulas for the sums of finite arithmetic and geometric sequences					
	P8.4	Compute the sums of infinite geometric series. Understand and apply the convergence criterion for geometric series.					
	P8.5	Understand and explain the principle of mathematical induction and prove statements using mathematical induction					
	P8.6	Prove the binomial theorem using mathematical induction. Show its relationship to Pascal's Triangle and to combinations. Use the binomial theorem to find terms in the expansion of a binomial to a power greater than 3.					
Analytical Geometry Chapter 11	P9.7	Know, explain, and apply the locus definitions of parabolas, ellipses and hyperbolas and recognize conic sections in applied situations					
	P9.8	Identify parabolas, ellipses and hyperbolas from equations, write the equations in standard form, and sketch an appropriate graph of the conic section					
	P9.9	Derive equation for a conic section from given geometric information. Identify key characteristics of a conic section form its equation or graph.					

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	P9.10	Identify conic sections whose equations are in polar or parametric form.					