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| **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 |  |  |  |  |  |
| A1.2.5 | Solve polynomial equations and equations involving rational expressions |  |  |  |  |  |
| **Unit** | **Standard** | **Capacity Breakdown** |  |  |  |  |  |
| **Review**Chapter 1 | Sec 1.5 | Use interval notation |  |  |  |  |  |
| Sec 1.5 | Solve and use properties of inequalities |  |  |  |  |  |
| Sec 1.6 | Solve equations involving Absolute Value |  |  |  |  |  |
| Sec 1.6 | Solve Inequalities involving Absolute Value |  |  |  |  |  |
| Sec 1.7 | Verbal descriptions into mathematical expressions | x | x |  |  | Life in the Fast lane |
| Sec 1.7 | Solve interest problems, uniform motion problems, mixture problems and constant rate job problems |  |  |  |  |  |
| **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 |  |  |  |  |  |
| P1.2 | Perform algebraic operations (including compositions) on functions and apply transformations(translations, reflections and rescaling) |  |  |  |  |  |
| P1.6 | Identify and describe discontinuities of a function(greatest integer function) and how these relate to the graph |  |  |  |  |  |
| P5.3 | Know and apply the definition and geometric interpretation of the difference quotient |  |  |  |  |  |
| P5.3 | Simplify difference quotients and interpret them as rates of change and slopes of secant lines |  |  |  |  |  |
| Sec 3.6  | Translate written description of a real world problem into a mathematical model |  |  |  |  |  |
| Sec 3.6 | Assign independent and dependent variables Be able to find minimum or maximum value in a real world problem |  |  |  |  |  |
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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 | x |  |  | Back to your Roots |
| P1.2 | Perform algebraic operations on functions and apply transformations(translations, reflections, and rescaling) |  |  |  |  |  |
| P1.8 | Explain how the rates of change of functions in different families (ex. Linear functions and quadratics) differ, referring to graphical representations |  |  |  |  |  |
| P3.2 | Apply quadratic functions and their graphs in context of motion under gravity and simple optimization problems |  |  |  |  |  |
| P3.3 | find a quadratic function to model a given data set or situation |  |  |  |  |  |
| 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  | x | x |  |  | Going Back to your roots |
| 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 multiplicities, testing the sign-on intervals and analyzing the function’s large-scale behavior. | x | x |  |  | Going back to your roots |
| P4.3  | Know and apply fundamental facts about polynomials: the remainder theorem, the factor theorem, and the fundamental theorem of algebra | x | x |  |  | Going back to your roots |
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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. | x | x |  |  | Going back to your roots |
| **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. | x | x |  |  | Going back to your roots |
| 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. |  |  |  |  |  |
| 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. |  |  |  |  |  |
| 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. e2x -4ex+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. | xx | xx |  |  | Unit Circle, Robotics 101 |
| 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 | x |  |  | Robotics 101 |
| Sec 7.7 | Graph transformations of tangent functions | x | x |  |  | Robotics 101 |
| P6.6 | Prove trigonometric identities and derive some of the basic ones. Know the fundamental identities. | x | x |  |  | Unit Circle |
| 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 | x |  |  | Robotics 101 |
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| **Unit** | **Standard** | **Capacity Breakdown** |  |  |  |  |  |
| **Analytic Trigonometry**Chapter 8 | P6.3 | Know the basic properties of the inverse trigonometric functions: sin-1x, cos-1x, tan-1x, including their domains and ranges. Recognize their graphs. | x | x |  |  | Robotics 101 |
| P6.4 | Know basic trigonometric identities for sine cosine and tangent ( Fundamental, sum and difference, co functions, double and half angle formulas) |  |  |  |  |  |
| P6.5 | Solve trigonometric equation using basic identities and inverse trigonometric functions | x | x |  |  | Robotics 101 |
| CCSS | Prove the addition and subtraction formula for sine, cosine, and tangent and use them to solve problems. | x | x |  |  | 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 | x |  |  | Robotics 101 |
| **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 | x |  |  | Life in the fast lane, Robotic 101 |
| **Unit** | **Standard** | **Capacity Breakdown** |  |  |  |  |  |
| **Polar Coordinates**Chapter 10 | P9.1 | Convert between polar and rectangular coordinates. Graph functions given in polar coordinates |  |  |  |  |  |
| 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. |  |  |  |  |  |
| 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. |  |  |  |  |  |
| P7.5 | Define the inverse of a matrix and compute the inverse of two-by-two and three-by-three matrices when they exist |  |  |  |  |  |
| 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 |  |  |  |  |  |
| P7.7 | Write systems of two and three equations in matrix form. Solve such systems using Gaussian elimination or inverse matrices.  |  |  |  |  |  |
| 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.  |  |  |  |  |  |
| P9.10 | Identify conic sections whose equations are in polar or parametric form. |  |  |  |  |  |