THE PHILLIPS ACADEMY

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Pre-Calculus

This course is designed to cover all of the advanced algebra and pre-calculus concepts found in a standard college preparatory Pre-Calculus curriculum. It is the fifth course in a six-course sequence that tells the story of mathematics. Topics include: simplifying using the order of operations, solving complex equations, solving linear inequalities, solving rational equalities, solving absolute value equations, solving absolute value inequalities, expansion of polynomials, algebraic long division, graphing linear equations, determining slope, determining linear equations, simplifying radials, 30-60-90 and 45-45-90 special right triangles, conversions between radians and degrees, conversions and simplifications between radicals and rational exponents, operations on and simplification of imaginary numbers, solving using the quadratic equation, simplifying and solving using factoring, solving radical equations, introduction to conic sections, equations of circles, graphing circles, equations of parabolas, graphing parabolas, equations of ellipses, graphing ellipses, equations of hyperbolas, graphing hyperbolas, solving the intersection of two conics graphically, solving the intersection of two conics algebraically, determining functions with the vertical line test, domain and range of functions, graphing complex functions, determining relative maximums and minimums, determining where functions increase and decrease, solving equations using substitution, advanced completing the square applications, solving rational inequalities, translations, symmetries, odd and even functions, solving right triangle word problems, Descarte's rules of signs and end behavior, vertical, horizontal, and oblique asymptotes, factoring and solving large polynomials and finding zeros using synthetic division, partial fraction decomposition, review of basic exponentials and logarithms, simplifying rational exponents, solving exponential equations, graphing exponential and logarithmic equations, simplifying logarithmic equations, exponential and logarithmic application problems, introduction to trigonometry, basic sine, cosine and tangent right triangle equations , radians versus degrees, conversions between decimal angles and degrees, minutes, seconds

angles, cosecant, secant, and cotangent right triangle equations, the unit circle, producing exact trigonometric answers for special angles, inverse trigonometric functions, arc length and angular and linear speed application problems, right triangle trigonometric application problems, calculating periods, phase shifts, and amplitudes, graphing all six trigonometric functions, introduction to the law of sines , introduction to the law of cosines, calculating the area of any triangle using sines, solving SAS, ASA, AAS, SSS, and SSA triangles, application problems, involving the law of sines and law of cosines, proving trigonometric identities, solving trigonometric equations involving identities and factoring, using the half/double angle formulas to calculate exact answers, using the sum/difference angle formulas to calculate exact answers, introduction to matrices, overview of the basic rules and operations involving matrices, calculating determinants on matrices up to and including 4x4 matrices, calculating inverses on matrices up to and including 4x4 matrices, solving systems of equations including 4x4 systems, solving application problems using matrices, solving systems using Cramer's rule, introduction to the complex plane, addition and subtraction in the complex plane, multiplication and division in the complex plane, absolute value of complex numbers, conversion between polar and rectangular forms, De Moivre's theorem and applications, determining the roots of complex numbers, polar graphs including cardioids, roses, spirals and limacons, introduction to vectors, basic operations on vectors, calculating the dot product between two vectors, vector application problems, introduction to sequences and series, summation notation, calculating finite and infinite sums, arithmetic sequences and series, application problems involving arithmetic sequences and series, geometric sequences and series, application problems involving geometric sequences and series, harmonic sequence and series, application problems involving harmonic sequences and series, quadratic sequences and series , cubic sequences and series, convergent and divergent sequences and series. By the end of this course, students will be prepared to tackle the Calculus curriculum.