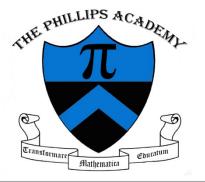
# THE PHILLIPS ACADEMY



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# TOPICAL OUTLINE FOR PRE-CALCULUS

### A. REVIEW OF ALGEBRA AND GEOMETRY

- 1. Simplifying Using the Order of Operations
- 2. Solving Complex Equations
- 3. Solving Linear Inequalities
- 4. Solving Rational Equalities
- 5. Solving Absolute Value Equations
- 6. Solving Absolute Value Inequalities
- 7. Expansion of Polynomials
- 8. Algebraic Long Division
- 9. Graphing Linear Equations
- 10. Determining Slope
- 11. Determining Linear Equations
- 12. Simplifying Radials
- 13. 30-60-90 and 45-45-90 Special Right Triangles
- 14. Conversions Between Radians and Degrees
- 15. Conversions and Simplifications Between Radicals and Rational Exponents
- 16. Operations on and Simplification of Imaginary Numbers
- 17. Solving Using the Quadratic Equation
- 18. Simplifying and Solving Using Factoring
- 19. Solving Radical Equations

# **B. CONIC SECTIONS**

- 1. Introduction to Conic Sections
- 2. Equations of Circles
- 3. Graphing Circles
- 4. Equations of Parabolas
- 5. Graphing Parabolas
- 6. Equations of Ellipses
- 7. Graphing Ellipses
- 8. Equations of Hyperbolas
- 9. Graphing Hyperbolas
- 10. Solving the Intersection of Two Conics Graphically
- 11. Solving the Intersection of Two Conics Algebraically

### C. ADVANCED ALGEBRA

- 1. Determining Functions with the Vertical Line Test
- 2. Domain and Range of Functions
- 3. Graphing Complex Functions
- 4. Determining Relative Maximums and Minimums
- 5. Determining Where Functions Increase and Decrease
- 6. Solving Equations Using Substitution
- 7. Advanced Completing the Square Applications
- 8. Solving Rational Inequalities
- 9. Translations
- 10. Symmetries
- 11. Odd and Even Functions
- 12. Solving Right Triangle Word Problems
- 13. Descarte's Rules of Signs and End Behavior
- 14. Vertical, Horizontal, and Oblique Asymptotes
- 15. Factoring and Solving Large Polynomials and Finding Zeros Using Synthetic Division
- 16. Partial Fraction Decomposition

# D. EXPONENTIALS AND LOGARITHMS

- 1. Review of Basic Exponentials and Logarithms
- 2. Simplifying Rational Exponents
- 3. Solving Exponential Equations
- 4. Graphing Exponential and Logarithmic Equations
- 5. Simplifying Logarithmic Equations
- 6. Exponential and Logarithmic Application Problems

# E. TRIGONOMETRY

- 1. Introduction to Trigonometry
- 2. Basic Sine, Cosine and Tangent Right Triangle Equations
- 3. Radians Versus Degrees
- 4. Conversions Between Decimal Angles and Degrees, Minutes, Seconds Angles
- 5. Cosecant, Secant, and Cotangent Right Triangle Equations
- 6. The Unit Circle
- 7. Producing Exact Trigonometric Answers for Special Angles
- 8. Inverse Trigonometric Functions
- 9. Arc Length and Angular and Linear Speed Application Problems
- 10. Right Triangle Trigonometric Application Problems
- 11. Calculating Periods, Phase Shifts, and Amplitudes
- 12. Graphing all Six Trigonometric Functions
- 13. Introduction to the Law of Sines
- 14. Introduction to the Law of Cosines
- 15. Calculating the Area of any Triangle Using Sines
- 16. Solving SAS, ASA, AAS, SSS, and SSA Triangles
- 17. Application Problems Involving the Law of Sines and Law of Cosines
- 18. Proving Trigonometric Identities
- 19. Solving Trigonometric Equations Involving Identities and Factoring
- 20. Using the Half/Double Angle Formulas to Calculate Exact Answers
- 21. Using the Sum/Difference Angle Formulas to Calculate Exact Answers

### F. MATRICES

- 1. Introduction to Matrices
- 2. Overview of the Basic Rules and Operations Involving Matrices
- 3. Calculating Determinants on Matrices up to and Including 4x4 Matrices
- 4. Calculating Inverses on Matrices up to and Including 4x4 Matrices
- 5. Solving Systems of Equations Including 4x4 Systems
- 6. Solving Application Problems Using Matrices
- 7. Solving Systems Using Cramer's Rule

# G. COMPLEX NUMBERS, POLAR GRAPHS, AND VECTORS

- 1. Introduction to the Complex Plane
- 2. Addition and Subtraction in the Complex Plane
- 3. Multiplication and Division in the Complex Plane
- 4. Absolute Value of Complex Numbers
- 5. Conversion Between Polar and Rectangular Forms
- 6. De Moivre's Theorem and Applications
- 7. Determining the Roots of Complex Numbers
- 8. Polar Graphs Including Cardioids, Roses, Spirals and Limacons
- 9. Introduction to Vectors
- 10. Basic Operations on Vectors
- 11. Calculating the Dot Product Between Two Vectors
- 12. Vector Application Problems

# H. SEQUENCES AND SERIES

- 1. Introduction to Sequences and Series
- 2. Summation Notation
- 3. Calculating Finite and Infinite Sums
- 4. Arithmetic Sequences and Series
- 5. Application Problems Involving Arithmetic Sequences and Series
- 6. Geometric Sequences and Series
- 7. Application Problems Involving Geometric Sequences and Series
- 8. Harmonic Sequence and Series
- 9. Application Problems Involving Harmonic Sequences and Series
- 10. Quadratic Sequences and Series
- 11. Cubic Sequences and Series
- 12. Convergent and Divergent Sequences and Series