PreCalculus (High School Math)

Course Curriculum (MPSL Academy)

Each Session: 1 hour 15 minutes

(First 10 min review of last week topics/HW, 50 min new topics, 15 min critical thinking Qs)

0. Preparing for PreCalculus

- Operations with Complex Numbers
- Quadratic Functions and Equations
- nth Roots and Real Exponents
- Systems of Linear Equations and Inequalities
- Sets, Matrix Operations & Statistics
- Probability with Permutations and Combinations

1. Functions from a Calculus Perspective

- Functions
- Analyzing Graphs of Functions and Rotations
- Continuity, End Behavior, and Limits
- Extrema and Average Rates of Change
- Parallel Functions and Transformations
- Function Operations and Composition of Functions
- Inverse Relations and Functions

2. Power, Polynomial, and Rational Functions

- Power and Radical Functions
- Polynomial Functions
- The Remainder and Factor Theorems
- Zeros of Polynomial Functions
- Rational Functions
- Nonlinear Inequalities

3. Exponential and Logarithmic Functions

- Exponential Functions
- Logarithmic Functions
- Properties of Logarithms
- Exponential and Logarithmic Equations
- Modeling with Nonlinear Regression

4. Trigonometric Functions

- Right Triangle Trigonometry
- Degree and Radians
- Trigonometric Functions on the Unit Circle
- Graphing Sine and Cosine Functions
- Graphing Other Trigonometric Functions
- Inverse Trigonometric Functions
- The Law of Sines and the Law of Cosines

5. Trigonometric Identities and Equations

- Verifying Trigonometric Identities
- Solving Trigonometric Equations
- Sum and Difference Identities
- Multiple-Angle and Product-to-Sum Identities

6. System of Equations and Matrices

- Multivariable Linear Systems & Row Operations
- Matrix Multiplication, Inverses, and Determinants
- Solving Linear Systems Using Inverses & Cramer's Rule
- Partial Fractions
- Linear Optimization

7. Conic Sections & Parametric Equations

- Parabolas
- Ellipses and Circles
- Hyperbolas
- Rotations of Conic Sections
- Parametric Equations

8. Vectors

- Introduction to Vectors
- Vectors in the Coordinate Plane
- Dot Products & Vector Projections
- Vectors in 3-Dimensional Space
- Dot & Cross Products of Vectors in Space

9. Polar Coordinates & Complex Numbers

- Polar Coordinates
- Graphs of Polar Equations
- Polar & Rectangular Forms of Equations
- Polar Forms of Conic Sections
- Complex Numbers & DeMoivre's Theorem

10. Sequences & Series

- Sequences, Series & Sigma Notation
- Arithmetic Sequences & Series
- Geometric Sequences & Series
- Mathematical Induction
- The Binomial Theorem
- Functions as Infinite Series

11. Inferential Statistics

- Descriptive Statistics
- Probability Distributions
- The Normal Distributions
- The Central Limit Theorem
- Confidence Intervals
- Hypothesis Testing
- Correlation & Linear Regression

12. Limits and Derivatives

- Estimating Limits Graphically
- Estimating Limits Algebraically
- Tangent Lines & Velocity
- Derivatives
- Area Under a Curve & Integration
- The Fundamental Theorem of Calculus

NOTE: **STUDENTS WILL PARTICIPATE IN VARIOUS STATE & NATIONAL LEVEL MATH COMPETITIONS LIKE MATHCOUNTS, MATH OLYMPIAD, MATH KANGAROO, CONTINENTAL MATH LEAGUE AND SO ON. OUR GOAL IS TO BUILD CONFIDENCE IN MATH IN AN EFFICIENT WAY RESULTING IN IMPROVING SCORES IN SCHOOL EXAM & SUCCEED IN NATIONAL/INTERNATIONAL MATH COMPETITIONS.**