Precalculus Exit Exam Expectations

- The student has 4 hours to complete the exam. The Precalculus Exit Exam consists of both multiple-choice questions and free response questions. Partial credit may be awarded on some items.

- No graphing calculators may be used on any part of this exam. A scientific calculator may be used.

- A minimum score of 77% on the exam is required in order for the student to advance to Calculus AB.

- The course content and student expectations appear below. Students may be tested on any content listed. Some topics may not be addressed in the textbook and are supplemented in the Troy School District Curriculum.


**Course Content**

**Functions:**
- Definition of relation and function
- Function notation
- Domain & range of functions
- Vertical Line Test
- Horizontal Line Test
- Relative maximums and minimums
- Piecewise functions
- Odd and even functions
- Parent graphs of power functions, exponential and logarithmic functions
- Horizontal and vertical shifts of all functions including power, exponential, logarithmic and polynomial
- Reflections & symmetries
- Non-rigid transformations
- Operations with functions including addition, subtraction, division, multiplication & composition
- Inverses of functions (graphical and algebraic approach)

**Polynomial and Rational Functions:**
- Analyzing graphs of polynomial and rational functions
- Using transformations to sketch graphs
- End behaviors of polynomial graphs
- Finding zeros (both real and complex) of polynomial functions
- Intermediate Value Theorem
- Remainder and Factor Theorems
- Rational Zero Test
- Upper and lower bounds for zeros of polynomial functions
- Complex numbers
- Fundamental Theorem of Algebra
- Domains and ranges of polynomial and rational functions
- Horizontal, vertical and slant asymptotes of rational functions
- Sketching graphs of rational functions
- Partial fraction decomposition
Exponential and Logarithmic Functions:
- Graphs of exponential and log functions including transformations
- Domain and range of exponential and logarithmic functions
- Base e and natural logs
- Using exponential and logarithmic functions to model and solve real-life problems
- Properties of logarithms & exponents
- Expanding and condensing logarithmic expressions
- Solving logarithmic and exponential equations
- Using exponential and logarithmic functions to model and solve real-life problems

Trigonometry:
- Radian and degree measures
- Unit circle
- Evaluating trigonometric functions (exact values required for special angles)
- Domain, range, amplitude and period of all trigonometric functions
- Graphs of trig functions (including translations, amplitude changes, phase shifts, period changes)
- Inverse trig functions
- Composition of trig functions
- Solving real life problems involving right triangles, directional bearings, harmonic motion
- Fundamental identities
- Verifying trigonometric identities
- Solving trigonometric equations
- Sum and difference formulas
- Multiple Angle and Product-Sum Formulas
- Law of Sines
- Law of Cosines
- DeMoivre's Theorem and trigonometric form of a complex number
- Powers and roots of complex numbers

Systems of Equations:
- Multivariable linear systems
- Systems of inequalities
- Linear programming

Matrices:
- Solving systems of equations with matrices
  - Gauss-Jordan elimination
  - Gaussian elimination with back substitution
  - Row-echelon form and reduced row-echelon form
- Operations with matrices
- Inverses of square matrices
- Determinants of square matrices
- Solving Matrix Equations
- Applications of matrices and determinants (including area of a triangle)
Sequences & Series:
Finding terms
Finding sums and partial sums
Arithmetic and geometric sequences and series
Applications of sequences and series to real life problems
Infinite series and sums of infinite series
Factorials
Proof by mathematical induction

Probability:
Fundamental Counting Principle
Permutations and Combinations
Probability of Events
The Binomial Theorem

Conics:
Standard form of conics
Finding the equation of a tangent line at a point on a parabola
Sketching graphs of conics including translations
Classification of conics in standard form
Rotation of conics
Parametric equations and their graphs
Polar Coordinates & Graphs of Polar Equations
Polar Equations of Conics

Analytic Geometry:
Distance and Midpoint Formulas in the plane and space
Spheres
Finding traces (xy, yz, xz)
Vectors in the plane
Unit vectors
Operations with vectors
Real life applications with vectors
Vectors and dot products
Vectors in 3 dimensions
Use of the cross product
Using Triple Scalar Product to find volume of parallelepiped
Parametric equations of lines & planes in space
Distance between a point and a plane
Sketching planes in space

Limits:
Operations with and properties of limits
Finding limits by substitution
Evaluating limits for polynomial and rational functions
Limits at infinity
Limits of a sum