

## Precalculus Honors Test Expectations

- This exit exam will be limited to 90 minutes. The Precalculus Honors 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 or Calculus BC.
- 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.
- Textbook: *Precalculus with Limits, Third Edition, 2014*; Author: Ron Larson.  
ISBN 13: 978-1-30533-534-9

## 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

**Derivatives:**

Limit definition of derivative

Derivatives of functions using the definition

\*Derivative of Polynomial functions using shortcut method (not in textbook)

\*First and second derivatives of polynomial functions

\*Velocity and acceleration applications of derivative

\*Graphing polynomial functions using the derivative

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