

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.
- Textbook: *Precalculus, Common Core, 2014 (McGraw Hill Publishers)* Authors: Carter, Cuevas, Day, Malloy, Bryan, Holliday, Hovsepian ISBN 13: 978-0-07664-183-3

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