**CPHS** **PreCalculus** **Honors** **Dual-Enrollment Syllabus 2020-2021**

**Teacher – Mrs. Volynskaya R. #111**

**E-mail: yvolynskaya@cliffsidepark.edu Web:**[**http://msvolynskaya.weebly.com**](http://msvolynskaya.weebly.com/)

**Credit**: 5 CPHS credits and 4 College Credits

**Textbook:** [**Precalculus with Limits with CalcChat, Ron Larson and Paul Battaglia, 4th edition**](https://www.calcchat.com/book/Precalculus-with-Limits-4e:-High-School)

**Course Description**: Pre-Calculus provides students an honors-level study of trigonometry, advanced functions, analytic geometry, and data analysis in preparation for calculus.

**It is extremely important that both student and parent understand the following:**

This is an advanced course, and the student will need to demonstrate a high level of responsibility throughout the class. Pre-Calculus Honors is a **rigorous course**, but you will succeed if you work hard and actively participate in class.

Students have the opportunity of earning 4 college credits through Bergen Community College if they meet the college course requirements and pay the tuition cost. Students who successfully complete this course will earn 5 HS credits and 4 College Credits.

Ask your counselor about APPLICATION **FOR COLLEGE CREDIT** during the first few weeks of school. MAKE SURE TO APPLY FOR THE COLLEGE CREDIT - this Credit WILL BE GIVEN ONLY TO STUDENTS WHO WILL SUBMIT an application!!!!

**Make-Up Work/Time**: Missed assignments/time due to an absence must be completed within 3 school days of the absence. All work assigned prior to a scheduled field trip is due the day of the students return. handbook for more details.

**Late Work**: No late work is accepted with the exception of absences. Students are only allowed to turn in late work if they are absent the day the work is assigned.

**Grading Policy**: MP averages are calculated using the following percentages:

Assessments -65% (Tests, Quizzes, etc.), Classwork: 20%, Homework:15%

**Honor Pledge:** Students will abide by the Honor Code not to give or receive unpermitted assistance in the preparation of any work or assessment that is to be used by the instructor as the basis of grading

## **Major Objectives of Precalculus**

Upon completion of this course, the student will be able to:

1. Find the domain and range of a function.

2. Find the maximum or minimum value of a quadratic function.

3. Find the inverse of a function.

4. Graph a polynomial function.

5. Find all zeros of a polynomial function.

6. Use the change of base formula to evaluate a logarithm.

7. Solve exponential and logarithmic equations.

8. Find trigonometric functions of

9. Demonstrate and understand the trigonometric ratios of a right triangle.

10. Use the laws of sines and cosines to solve a triangle.

11. Solve a trigonometric equation.

12. Multiply and divide complex numbers in trigonometric form.

13. Solve systems of linear equations in two and three variables.

14. Expand a binomial expression.

15. Find Limits Numerically and Graphically.

PreCalculus Honors Course **tentative plan/pacing guide**:

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| --- | --- | --- |
| Time Unit | Objective | Student Will be able To |

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| --- | --- | --- |
| **Unit 1 Functions and Their Graphs**    September 10-  October 14 | Transform relations in two dimensions; describe the results algebraically and geometrically | Determine if a relation is a function from algebraic representations, graphs, tables, sets of ordered pairs, and verbal descriptions.  Determine and interpret the **domain, range, and zeros** from graphs and alg representations  State in **interval and set notation** |
|  |  | Identify **even and odd** functions and describe their symmetry. (Alg and graphically)  Identify key features of a given function:  **Max**/**Min**: absolute and relative  **End** behavior  **Intercepts, Increasing/ Decreasing**  For what values is the function **Positive/Negative**  **Domain/Range** |
|  |  | Solve **Absolute Value** Equations and Inequalities algebraically and graphically |
|  |  | Graph **piecewise** functions and represent functions involving absolute value in piecewise form.  Graph simple functions by hand and using technology. |
|  |  | Apply basic transformations a. y = f(x-c) , y = f(x) + c , y = f(cx) , y = cf(x) b. y = |f(x)|, y = f(|x|) c. y = - f(x) y = f(-x) |
|  | **Use the composition and inverse of functions to model and solve problems** | **Combinations/composites of Functions**  Perform sum, difference, product and quotient combinations of functions  Perform the composition of two or more functions and state the domain of the composition  Identify the original functions that make up a composition  Evaluate the **difference quotient** |
|  |  | **Inverses**  Define and verify inverse functions Determine if a function is one-to-one, and restrict the domain if necessary  Find an inverse function algebraically and graphically and state its **domain** |
|  |  | Review of Unit 1/Chapter 1 |
|  |  | Test Chapter 1 |
| **Unit 2 Polynomials and Rational Functions** October 15-  November 30 | Use the quadratic relations (parabolas, circle, ellipse, hyperbola) to model and solve problems; justify result | **Quadratic Functions**  Solve Quadratic Equations by factoring, taking square roots, completing the square, quadratic formula  Find the x and y intercepts of a Quadratic Function  Identify the vertex using the relationship between the zeros and the vertex Interpret parameters in the context of a problem. Use equivalent forms of quadratics to interpret key features of quadratics. |
|  | Use polynomial functions to model and solve problems; justify results | **Polynomial Functions of Higher Degree**  Use the leading coefficient test to determine end behavior of polynomials  Find the zeros (and multiplicity) of a polynomial algebraically  Sketch polynomials using leading coefficient test, roots and their multiplicity, y-intercept and other points without a calculator |
|  |  | **Real Zeros** of Polynomial Functions Divide polynomials using long division and synthetic division (review from Alg 2)  Know and apply the **Intermediate Value, Rational Root**, **Remainder, and Factor Theorems** |
|  |  | The **Fundamental Theorem** of Alg.  Find all zeros of polynomials both real and imaginary Understand the nature of complex conjugate zeros Determine the polynomial function from given roots |
|  |  | Polynomial Inequalities Solve algebraically (**sign line test**) and graphically |
|  | For sets of data, create, and use calculator-generated models of polynomial functions | Use polynomial equations or functions to model and solve problems.  Use calculator to generate models for sets of data  Use the appropriate model to draw conclusions and make predictions |
|  | Use polynomial and rational functions to model and solve problems; justify results | Rational Functions and Asymptotes Determine the **domain** of Rational Functions  Find and distinguish between horizontal, vertical and slant asymptotes  Graph Rational Functions using key features\*  Graph functions by hand and using technology |
|  |  | Rational equations and inequalities Solve rational equations using multiple representations;  Determine when extraneous solutions arise Solve rational inequalities algebraically (**sign line test**) and graphically |
|  |  | Review/Test Chapter 2 |
| Unit 3 **Exponential and Logarithmic** Functions  January 4-29 | Use exponential and logarithmic functions to model and solve problems; justify results For sets of data, create, and use calculator-generated models of exponential and logarithmic functions | Exponential and Logarithmic Functions and Their Graphs Compare and contrast graphs of exponentials and their transformations Recognize key features\* of exponential and logarithmic graphs Understand the inverse relationship between exponential and logarithmic functions Compare, contrast and recognize graphs of logarithmic functions and their transformations |
|  |  | **Properties of Logarithms**  Discuss the relationship between logarithms and natural logarithms and the context for usage of each  **Use properties** to expand, condense and evaluate logarithms and natural logarithms  Relate to exponential rules |
|  |  | **Solving Exponential and Logarithmic Equations**  Solve exponential and logarithmic equations using graphs, tables, algebraic methods, and technology. Determine reasonableness of solutions. |
|  |  | **Modeling**  Use exponential and logarithmic equations or functions to model and solve a variety of problem situations (for example: population growth, spread of disease, compound interest, annuities, mortgages, pH, intensity of sound, intensity of earthquakes, etc.)  Interpret the parameters in context Create and analyze models of expl and logarithmic functions. |
|  |  | **Unit 3 Review/ Unit 3 Test** |
| **Unit 4, Trigonometric Functions** February 1-26 | Use trigonometric and inverse trigonometric functions to model and solve problems; justify results. | **Radian and Degree Measure Convert** radian to degree measure and vice versa  Draw rotational angles  Determining quadrants of angles Finding **reference, coterminal, complementary and supplementary** angles  Finding arc length |
|  |  | **Right Triangle Trigonometry Define** trigonometric functions Evaluating trig functions using Pythagorean theorem  Solve special right triangles  Know the reciprocal and quotient identities ;Use trigonometric ratios (SOHCAHTOA) to solve problems |
|  |  | **The Unit Circle**  Degree and radian equivalents of multiples of special angles Definitions of trig function Evaluating all 6 trig functions of angles on the unit circle |
|  | Create and identify transformations with respect to period, amplitude, and vertical and horizontal shifts. | **Trigonometric Graphs**  Graphs of sine and cosine functions  Introduce secant and cosecant graphs Determine the key features\* of sine, cosine, secant, cosecant Determine amplitude, period, phase shift, and vertical shift algebraically and graphically |
|  |  | **Trigonometric Graphs**  Introduce tangent and cotangent graphs  Determine the key features\* of tangent and cotangent graphs Determine period, phase shift, and vertical shift algebraically and graphically |
|  |  | **Inverse Trig Functions Understand** the need to restrict the domain of sine, cosine and tangent functions  Graph inverse trig functions and evaluate inverse trig functions  Find value of compositions of trig functions  Use graphing calculator to evaluate trigonometric functions and inverse trigonometric functions |
|  |  | **Trigonometric applications and models**  Choose trigonometric functions to model periodic phenomena |
|  |  | **Review/ Unit 4 Test** |
| **Unit 5 Analytical Trigonometry March 1-31** | Use trigonometric and inverse trigonometric functions to model and solve problems; justify results. | **Using Fundamental Identities** Investigate and apply basic trig identities  Simplify and factor trig expressions  Verify trig identities |
|  |  | **Solving trig equations**  Solve trig equations algebraically and graphically (with graphing calculator) |
|  |  | **Sum & Difference formulas** Derive and apply sum and difference formulas  Use sum and difference formulas to find exact value of a trig function Apply formulas with right triangles |
|  |  | **Double and Half Angle formulas Derive** and apply double and half angle formulas  Use double and half angle formulas to find exact values of a trig function Apply formulas with right triangles |
|  |  | **Unit 5 Review/Test** |
| **Unit 6 Additional Topics in Trigonometry** April 12-30 | Use trigonometric and inverse trigonometric functions to model and solve problems; justify results. Develop and use the **law of sines and the law of cosines.** | **Law of Sines**  Solve oblique triangles using the Law of Sines Determine the number of possible triangles that can exist using Law of Sines |
|  |  | **Law of Cosines**  Solve oblique triangles using the Law of Cosines |
|  |  | **Law of Sines/Cosines Application Problems; Area of triangle**  Apply the Law of Sines and the Law of Cosines in application problems Find the area of an oblique triangle using (½)absinC  Apply Heron’s Formula to find the area of an oblique triangle |
|  |  | **Unit 6 Review/Test** |
| **Unit 7 Limits May 3-June 21** | Explore the limit of a function graphically, numerically, and algebraically | **Introduction to Limits**  Estimate limits from graphs  Determine if a limit exist  Use properties of limits to find limits |
|  |  | **Techniques for Evaluating Limits** Evaluate limits through direct substitution  Evaluate limits by simplifying rational functions either by factoring or rationalizing  Evaluate one-sided limits |
|  |  | **Limits at Infinity** |
|  |  | **Unit 7 Limits Review/Test** |