**CCGPS Accelerated PreCalculus**
**Syllabus**

**Course:** Accelerated PreCalculus

**Instructor:**
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Tutoring will be offered:

Monday – Friday 7:00-8:00 am

**Required Texts:**
Foerster, P. A. (2007). *PreCalculus with Trigonometry Concepts and Applications.* Emeryville : Key Curriculum Press.

Many online resources and other documents will be provided to you at
www.the-y-axis.weebly.com
An enrichment/extra credit unit can be found at
www.trigthroughtime.weebly.com

I have created a Facebook page for our classes called SoY, (students of Yoder) where you can contact me outside of school.

**Course Description:** Accelerated CCGPS PreCalculus is taken after having completed the prerequisite courses Accelerated Coordinate Algebra/Analytic Geometry A and Accelerated Analytic Geometry B/Advanced Algebra. It is a prerequisite for taking AP Calculus AB or AP Calculus BC and is strongly recommended before taking AP Statistics. It consists of 7 Units: Conic Sections, Trigonometric Functions, Trigonometry of General Triangles, Trigonometric Identities, Matrices, Vectors and Probability. This course will move at a very rapid pace but the intent is to develop a deep conceptual understanding of each topic, making connections to other areas and topics in mathematics and to develop problem-solving skills that will carry into advanced level mathematics. The guiding principles are the process standards of the National Council for Teachers of Mathematics and these include:

- Build new mathematical knowledge through problem solving
- Solve problems that arise in mathematics and in other contexts
- Apply and adapt a variety of appropriate strategies to solve problems

- Monitor and reflect on the process of mathematical problem solving
- Make and investigate mathematical conjectures
- Develop and evaluate mathematical arguments and proofs
- Organize and consolidate their mathematical thinking through communication
- Communicate their mathematical thinking coherently and clearly to peers, teachers, and others
- Analyze and evaluate the mathematical thinking and strategies of others
- Use the language of mathematics to express mathematical ideas precisely
- Recognize and use connections among mathematical ideas
- Understand how mathematical ideas interconnect and build on one another to produce a coherent whole
- Create and use representations to organize, record, and communicate mathematical ideas
- Select, apply, and translate among mathematical representations to solve problems
- Use representations to model and interpret physical, social, and mathematical phenomena

Students will be expected to analyze, interpret and produce multiple representations of mathematical concepts including tables, graphs, equations and expressions as well as written explanations. Technology will be embedded throughout the course, using free online programs such as Geogebra or Desmos and demonstrations from Wolfram Mathematica. It is expected that every student will have access to a graphing calculator or a graphing software program. Within the course links will be provided for tools that students will use.

**CCGPS Standards:**
**Perform arithmetic operations with complex numbers.**

MCC9-12.N.CN.3 (+) Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers.

**Represent complex numbers and their operations on the complex plane.**

MCC9-12.N.CN.4 (+) Represent complex numbers on the complex plane in rectangular and polar form (including real and imaginary numbers), and explain why the rectangular and polar forms of a given complex number represent the same number.

MCC9-12.N.CN.5 (+) Represent addition, subtraction, multiplication, and conjugation of complex numbers geometrically on the complex plane; use properties of this representation for computation.

MCC9-12.N.CN.6 (+) Calculate the distance between numbers in the complex

plane as the modulus of the difference, and the midpoint of a segment as the average of the numbers at its endpoints.

**Represent and model with vector quantities.**

MCC9-12.N.VM.1 (+) Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., *v,* |v|, ||v||, *v).*

MCC9-12.N.VM.2 (+) Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.

MCC9-12.N.VM.3 (+) Solve problems involving velocity and other quantities that can be represented by vectors. Perform operations on vectors.

MCC9-12.N.VM.4 (+) Add and subtract vectors.

MCC9-12.N.VM.4a (+) Add vectors end-to-end, component-wise, and by the parallelogram rule. Understand that the magnitude of a sum of two vectors is typically not the sum of the magnitudes.

MCC9-12.N.VM.4b (+) Given two vectors in magnitude and direction form, determine the magnitude and direction of their sum.

MCC9-12.N.VM.4c (+) Understand vector subtraction $v - w$ as $v + (-w)$, where (–w) is the additive inverse of *w,* with the same magnitude as *w* and pointing in the opposite direction. Represent vector subtraction graphically by connecting the tips in the appropriate order, and perform vector subtraction component- wise.

MCC9-12.N.VM.5 (+) Multiply a vector by a scalar.

MCC9-12.N.VM.5a (+) Represent scalar multiplication graphically by scaling vectors and possibly reversing their direction; perform scalar multiplication component-wise, e.g., as c(vx, *vy)* = (cvx, cvy).

MCC9-12.N.VM.5b (+) Compute the magnitude of a scalar multiple cv using ||cv|| = |c|v. Compute the direction of cv knowing that when |c|v = 0, the direction of cv is either along *v* (for c > 0) or against *v* (for c < 0).

**Perform operations on matrices and use matrices in applications.**

MCC9-12.N.VM.6 (+) Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network.

MCC9-12.N.VM.7 (+) Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled.

MCC9-12.N.VM.8 (+) Add, subtract, and multiply matrices of appropriate dimensions.

MCC9-12.N.VM.9 (+) Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.

MCC9-12.N.VM.10 (+) Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.

MCC9-12.N.VM.11 (+) Multiply a vector (regarded as a matrix with one column) by a matrix of suitable dimensions to produce another vector. Work with matrices as transformations of vectors.

MCC9-12.N.VM.12 (+) Work with 2 X 2 matrices as transformations of the plane, and interpret the absolute value of the determinant in terms of area.

**Solve systems of equations**

MCC9-12.A.REI.8 (+) Represent a system of linear equations as a single matrix equation in a vector variable.

MCC9-12.A.REI.9 (+) Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 × 3 or greater).

**Build new functions from existing functions MCC9-12.F.BF.4 Find inverse functions.**

MCC9-12.F.BF.4d (+) Produce an invertible function from a non-invertible function by restricting the domain.

**Extend the domain of trigonometric functions using the unit circle**

MCC9-12.F.TF.3 (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for $\pi/3$, $\pi/4$ and $\pi/6$, and use the unit circle to express the values of sine, cosine, and tangent for $\pi - x$, $\pi + x$, and $2\pi - x$ in terms of their values for x, where x is any real number.

MCC9-12.F.TF.4 (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.

**Model periodic phenomena with trigonometric functions**

MCC9-12.F.TF.6 (+) Understand that restricting a trigonometric function to a

domain on which it is always increasing or always decreasing allows its inverse to be constructed.

MCC9-12.F.TF.7 (+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.★

**Prove and apply trigonometric identities**

MCC9-12.F.TF.9 (+) Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems**.**

**Apply trigonometry to general triangles**

MCC9-12.G.SRT.9 (+) Derive the formula A = (1/2)ab sin(C) for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.

MCC9-12.G.SRT.10 (+) Prove the Laws of Sines and Cosines and use them to solve problems.

MCC9-12.G.SRT.11 (+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).

**Translate between the geometric description and the equation for a conic section**

MCC9-12.G.GPE.3 (+) Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant.

**Use the rules of probability to compute probabilities of compound events in a uniform probability model**

MCC9-12.S.CP.8 (+) Apply the general Multiplication Rule in a uniform probability model, P(A and B) =[P(A)]x[P(B|A)] =[P(B)]x[P(A|B)], and interpret the answer in terms of the model.★

MCC9-12.S.CP.9 (+) Use permutations and combinations to compute probabilities of compound events and solve problems.★

**Calculate expected values and use them to solve problems**

MCC9-12.S.MD.1 (+) Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.★

MCC9-12.S.MD.2 (+) Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.★

MCC9-12.S.MD.3 (+) Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value. *For example, find the theoretical probability distribution for the number of correct answers obtained by guessing on all five questions of a multiple-choice test where each question has four choices, and find the expected grade under various grading schemes.*

MCC9-12.S.MD.4 (+) Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value. *For example, find a current data distribution on the number of TV sets per household in the United States, and calculate the expected number of sets per household. How many TV sets would you expect to find in 100 randomly selected households?*

**Use probability to evaluate outcomes of decisions**

MCC9-12.S.MD.5 (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.

MCC9-12.S.MD.5a (+) Find the expected payoff for a game of chance. *For example, find the expected winnings from a state lottery ticket or a game at a fast-food restaurant.*

MCC9-12.S.MD.5b (+) Evaluate and compare strategies on the basis of expected values. *For example, compare a high-deductible versus a low-deductible automobile insurance policy using various, but reasonable, chances of having a minor or a major accident.*

MCC9-12.S.MD.6 (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).

MCC9-12.S.MD.7 (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).

**Course Schedule:**

This course is scheduled to begin Monday, August 5th and will conclude Friday December 20th. The course schedule runs from Monday to Friday. Please take note that all weekly assignments will be due by Sunday at 11:59 pm.

The following topics will be covered in this course. Assessment dates are tentative:

| | |
|---|---|
| Unit 1 Conic Sections | Test 8/20 |
| Unit 2 Trig Functions | Test 9/4 |
| Unit 3 Trigonometry of General Triangles | Test 9/16 |
| Unit 4 Trig Identities | Test 9/27 |
| Unit 5 Matrices | Test 10/24 |
| Unit 6 Vectors and Complex Numbers | Test 11/14 |
| Unit 7 Probability | Test 12/12 |

**Grading Policy & Assessments:**

All assignments will be graded using the following scale:

- A = 90-100
- B = 80-89
- C = 74-79
- D = 70-73
- F = Below 70 Grades will be determined using the weighted system below:

| | |
|---|---|
| **Conic Sections** | **10** |
| **Trigonometric Functions** | **15** |
| **Trigonometry of Triangles** | **10** |
| **Trigonometric Identities** | **15** |
| **Matrices** | **10** |
| **Vectors** | **10** |
| **Probability** | **15** |
| **Final Exam** | **15** |