Pre-Calculus

Fall 2021

Ms. Hannah Schafer
Phone: (404) 654-3163
Email: hannah.schafer@atlanta.k12.ga.us

Room: 313
Tutorial: Wednesdays
Or by appointment

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Course Information

Below is the information required to join my Google Classrooms for each of my respective sections:

A Day, 2nd Period	A Day, 3rd Period	A Day, 4th Period	B Day, 4th Period
Google Classroom Code **jupr4ou**	Google Classroom Code **tedeghg**	Google Classroom Code **eeqebna**	Google Classroom Code **7anwrcy**

Pre-Calculus focuses on standards to prepare students for a more intense study of mathematics. The critical areas organized in seven units delve deeper into content from previous courses. The study of circles and parabolas is extended to include other conics such as ellipses and hyperbolas. Trigonometric functions are introduced and developed to include inverses, general triangles and identities. Matrices provide an organizational

structure in which to represent and solve complex problems. Students expand the concepts of complex numbers and the coordinate plane to represent and operate upon vectors. Probability rounds out the course using counting methods, including their use in making and evaluating decisions. The Mathematical Practice Standards apply throughout each course and, together with the content standards, prescribe that students experience mathematics as a coherent, useful, and logical subject that makes use of their ability to make sense of problem situations.

Required Materials

All of the materials required for students to utilize will be provided on an as-needed basis. We will be accessing elements from the Georgia Department of Education Units of Study in conjunction with Khan Academy, IXL, CK-12, and DeltaMath. We will also reference published texts when needed to enhance comprehension.

Students must provide a 1-inch binder, loose-leaf paper, and pencils.

Evaluation

Below is a breakdown of the grade weights that influence students' final grades.

Deliverable Type	Weight
Homework	5%
Summative Assessments	20%
Classwork & Quizzes	30%
Performance Tasks	25%
Cumulative Final Exam	20%

Grade Scale: A 100-89.5%; B 89.4-79.5%; C 79.4-69.5%; D 69.4-59.5%; F <60%

Summative assessments include all exams excluding the final cumulative assessment. All projects and similar assignments will be included in the Performance Task category. The category for each assignment will be predetermined and announced when the task is initially assigned.

Students whose numerical grades drop below 70 may recover their grade through the use of assignments provided by the teacher utilizing one of the following approved platforms: Edgenuity, USA Test Prep, and IXL.

Academic & Behavioral Expectations

What does it take to be successful in this course?

- Come to class on time, and stay for the duration of the class period;
- Actively take notes when we are learning a new concept;
- Ask questions when you do not understand something; and,
- Complete assignments and turn them in by the due date, or request an extension if you think you will need more time.

What behavior is considered appropriate?

- Listening quietly when the instructor or another student is speaking;
- Following directions after being asked once;
- Utilizing technology when it is allowed; and,
- Helping peers who do not understand a topic.

What behavior is considered inappropriate?

- Using technology when it is not allowed;
- Talking over the speaker;
- Not following directions after being asked multiple times; and,
- Claiming somebody else's work as your own.

What are the consequences for inappropriate behavior?

First occurrence	A verbal acknowledgement, documented in Infinite Campus
Second occurrence	A verbal and written acknowledgement sent to student and parent, documented in Infinite Campus
Third occurrence	A meeting to come up with an action plan with student, parent, and assistant principal, documented in Infinite Campus

Issues involving academic integrity, like cheating, immediately result in a meeting with the student, parent, and assistant principal.

Note: I do not expect a student to show perfect behavior every day. That would be an impossible standard for anybody. I ask that you give me your best, whatever that is on any given day.

Make-Up Work

Students are expected to make up work they missed while they were absent. When an absence occurs, it is the student's responsibility to retrieve and/or complete any assignment(s) from the teacher's Google Classroom. Communication is required in order to develop a new timeline for the missing assignments. This can be done via email or text.

Tutorial & Conferencing

On Wednesday, after school, I will be available for tutorial in my classroom. During this time I will be available for specific questions related to homework, classwork, or study.

In the event that a student is absent and needs supplemental guidance to catch up, it is the student's responsibility to inform me of their intent to attend the tutorial and request a more in-depth review of the information they missed. This is necessary in order for me to adequately prepare materials and ensure all other students still get the assistance they need.

In the event that many students seem to misunderstand a concept in class, I will schedule a more structured tutorial session during which all students will have the opportunity to further comprehend a topic or make up classwork. These sessions will be announced at least two days in advance.

For one-on-one guidance outside of normal tutorial sessions, use this link to schedule an appointment with me.

Statement of Academic Integrity

Academic dishonesty is the failure to maintain academic integrity. Academic dishonesty includes but is not limited to: cheating, (using or attempting to use unauthorized materials, information, or study aids in any academic exercise); fabrication, (falsification or invention of any information or citation in an academic exercise); bribery offered for grades, transcripts, or diplomas; obtaining or giving aid on an examination; having unauthorized prior knowledge of an examination; doing work for another student, presenting another student's work as one's own; and plagiarism. These actions result in a required meeting with the student, parent, and assistant principal; and, the assignment in question must be redone.

Units & Standards

Unit 1 | Introduction to Trigonometric Functions: Students will use the unit circle to extend the domain of trigonometric functions to include all real numbers. Students will develop understanding of the radian measure of an angle, graph trigonometric functions, and derive and apply the Pythagorean identity.

- **MGSE9-12.F.IF.7** Graph functions expressed algebraically and show key features of the graph both by hand and by using technology.
- **MGSE9-12.F.IF.7e** Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. Extend the domain of trigonometric functions using the unit circle
- **MGSE9-12.F.TF.1** Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.
- **MGSE9-12.F.TF.2** Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle. Model periodic phenomena with trigonometric functions
- **MGSE9-12.F.TF.5** Choose trigonometric functions to model periodic phenomena with Build new functions from existing functions

Unit 2 | Trigonometric Functions: Building on standards from Unit 1, students extend their study of the unit circle and trigonometric functions. Students will create inverses of trigonometric functions and use the inverse functions to solve trigonometric equations that arise in real-world problems.

- **MGSE9-12.F.BF.4** Find inverse functions.
- **MGSE9-12.F.BF.4d** Produce an invertible function from a non-invertible function by restricting the domain.
- **MGSE9-12.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.
- **MGSE9-12.F.TF.4** Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.
- **MGSE9-12.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.
- **MGSE9-12.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.

Unit 3 | Trigonometry of General Triangles: Building on standards from Unit 1 and Unit 2, students will apply trigonometry to general triangles. Students will derive the

trigonometric formula for the area of a triangle and prove and use the Laws of Sines and Cosines to solve problems.

- **MGSE9-12.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.
- **MGSE9-12.G.SRT.10** Prove the Laws of Sines and Cosines and use them to solve problems.
- **MGSE9-12.G.SRT.11** Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and nonright triangles (e.g., surveying problems, resultant forces).

Unit 4 | Trigonometric Identities: Building on standards from the first three units, students will prove and use addition, subtraction, double, and half-angle formulas to solve problems.

- **MGSE9-12.F.TF.9** Prove addition, subtraction, double and half-angle formulas for sine, cosine, and tangent and use them to solve problems.

Unit 5 | Matrices: Students will perform operations on matrices, use matrices in applications, and use matrices to represent and solve systems of equations.

- **MGSE9-12.N.VM.6** Use matrices to represent and manipulate data, e.g., transformations of vectors.
- **MGSE9-12.N.VM.7** Multiply matrices by scalars to produce new matrices.
- **MGSE9-12.N.VM.8** Add, subtract, and multiply matrices of appropriate dimensions.
- **MGSE9-12.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.
- **MGSE9-12.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.
- **MGSE9-12.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
- **MGSE9-12.A.REI.8** Represent a system of linear equations as a single matrix equation in a vector variable
- **MGSE9-12.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).

Unit 6 | Conics: Building on standards from previous courses, students will derive the equations of conic sections (parabolas, ellipses, and hyperbolas). Students will solve systems of a linear and quadratic equation in two variables.

- **MGSE9-12.G.GPE.2** Derive the equation of a parabola given a focus and directrix.
- **MGSE9-12.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

- **MGSE9-12.A.REI.7** Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.

Unit 7 | Vectors: Students will extend their understanding of complex numbers and their operations through graphical representations. Students will perform operations on vectors and use the operations to represent various quantities.

- **MGSE9-12.N.CN.3** Find the conjugate of a complex number; use the conjugate to find the absolute value (modulus) and quotient of complex numbers. Represent complex numbers and their operations on the complex plane
- **MGSE9-12.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.
- **MGSE9-12.N.CN.5** Represent addition, subtraction, multiplication, and conjugation of complex numbers geometrically on the complex plane; use properties of this representation for computation. For example, $(-1 + \sqrt{3}i)3 = 8$ because $(-1 + \sqrt{3}i)$ has modulus 2 and argument 120°.
- **MGSE9-12.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
- **MGSE9-12.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).
- **MGSE9-12.N.VM.2** Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.
- **MGSE9-12.N.VM.3** Solve problems involving velocity and other quantities that can be represented by vectors. Perform operations on vectors
- **MGSE9-12.N.VM.4** Add and subtract vectors.
- **MGSE9-12.N.VM4a** 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.
- **MGSE9-12.N.VM4b** Given two vectors in magnitude and direction form, determine the magnitude and direction of their sum.
- **MGSE9-12.N.VM4c** 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.
- **MGSE9-12.N.VM.5** Multiply a vector by a scalar.
- **MGSE9-12.N.VM.5a** Represent scalar multiplication graphically by scaling vectors and possibly reversing their direction; perform scalar multiplication component-wise, e.g., as $c(vx, vy) = (cvx, cvy)$.

- **MGSE9-12.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).
- **MGSE9-12.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.

Unit 8 | Probability: Students will extend their study of probability by computing and interpreting probabilities of compound events. Students will calculate expected values and use them to solve problems and make informed decisions.

- **MGSE9-12.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.
- **MGSE9-12.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
- **MGSE9-12.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.
- **MGSE9-12.S.MD.2** Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.
- **MGSE9-12.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 multiplechoice test where each question has four choices, and find the expected grade under various grading schemes.
- **MGSE9-12.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
- **MGSE9-12.S.MD.5** Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.
- **MGSE9-12.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.
- **MGSE9-12.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.

- **MGSE9-12.S.MD.6** Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).
- **MGSE9-12.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).