

# PreAP<sup>®</sup> Precalculus - Syllabus

Mr. Kevin Korpi  
Room 903  
830-627-6093  
Email: [kkorpi@nbsd.org](mailto:kkorpi@nbsd.org)  
Website: [www.korpiworld.com](http://www.korpiworld.com)

Tutorials: Mornings, lunch period, after school until 4:20 (except Tuesdays)

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## Course Philosophy

In Precalculus, students continue to build on the K – 8, Algebra I, Algebra II, and Geometry foundations as they expand their understanding through other mathematical experiences. Students use symbolic reasoning and analytical methods to represent mathematical situations, to express generalizations, and to study mathematical concepts and the relationships among them. Students use functions, equations, and limits as useful tools for expressing generalizations and as a means for analyzing and understanding a broad variety of mathematical relationships. Students also use functions as well as symbolic reasoning to represent and connect ideas in geometry, probability, statistics, trigonometry, and calculus and to model physical situations. Students use a variety of representations (concrete, numerical, algorithmic, graphical, symbolical, and verbal), and technology (TI calculators) to model functions and equations and solve real-life problems.

As students do mathematics, they continually use problem solving, language and communication, connections within and outside mathematics, and reasoning. Students also use multiple representations, applications and modeling, justification and proof, and computation in problem-solving contexts.

## Course Objectives

The purpose of this course is to provide students a brief review of algebra, and to further explore and analyzed more deeply those algebra topics and to introduce students to Trigonometry. In particular, specific objectives are to help students to:

- learn the fundamental concepts of algebra, trigonometry, and analytical geometry
- understand the properties of different functions
- know the graphs of different functions and their properties
- be aware of the plethora of applications of pre-calculus

In-class participation is expected (this includes, but not limited to, answering questions, asking questions, presentations. Clearly, attendance is a necessary, but not a sufficient condition for participation.)

## Reference Textbook

Demana, Waits, Foley, and Kennedy. *Precalculus: Graphical, Numerical, Algebraic*. 7<sup>th</sup> ed. Pearson Addison-Wesley, Boston, MA, 2007. *To facilitate in-class discussions, it is recommended that you do some pre-reading of the text.*

## Pre Requisites

Two years of High School Algebra (I & II) & Geometry. A willingness to work hard, to spend at least 8 hours weekly on this course OUTSIDE of class time, and to think analytically.

## Teaching Philosophy

This course will focus not only on learning the necessary skills and operations but also on the mathematical theories and implications of the concepts. You will learn critical reading and thinking skills, how to express yourself both verbally and in writing, and how to manage your time and learn math effectively. This will NOT be a “watch what I do, do what I do” course. You will be actively involved in creating your own knowledge. Tests will not be carbon copies of the review or practice test. In order to better assess students’ understanding, students will be required to apply the information they have learned in a new context on the tests. They will also be asked to explain and evaluate, in writing, various theories and mathematical concepts. Throughout the year, students will develop skills that will be valuable their entire lives: self-discipline, self-confidence, rigorous habits of mind, problem solving skills, and a love of learning. At the end of the course, students will be well prepared to take calculus, statistics, or any similar college mathematics course, and will be able to think and learn for himself and will have developed the ability to answer the questions that stem from his own curiosity.

## Teaching Strategies

### **Daily Warm Up**

At the beginning of each period, students are given up to 3 questions to complete. These questions may be review or a lead-in to the lesson. Differing methods of solution are shared and discussed.

### **Homework**

There will be a homework worksheet that will be due the day after a particular section is completed. Homework is due at the beginning of class without exceptions (whether it is electronically submitted with a time stamp or handed in on paper). Students will not be allowed to “finish” their homework in class. Homework will be graded for completion and presentation only on a 4 point scale (1 = 25, 2 = 50, 3 = 75, 4 = 100). Occasionally students will be asked to present their work to the class. I will also occasionally give students an assignment similar to the homework that I will grade for accuracy rather than completion (this includes style, form, mathematical syntax, etc.) Assignments should be your own independent work. Students with questions from the previous assignment might have their questions answered by fellow “expert” students. These “expert” present the problems in a step-by-step manner and verbally explain the sequence and the rational. This usually leads to great peer discussion about alternate representations and approaches to a particular problem.

### **Test Review**

On the day before the test, I will let students know the types of questions that will be on the test, both multiple choice and free-response. Student questions regarding lack of understanding should be answered as soon as they arise. Waiting until the day of the test is a bad approach to successfully completing the test. Additionally, morning tutorials are crowded on test mornings, meaning, I will possibly be unable to work with you exclusively if at all, as my attention is divided.

### **Exams and Quizzes**

There will be **at least two** in-class exams each six weeks grading period and a comprehensive in-class final exam during finals week. All exams will consist of both a multiple-choice and free-response section.. On some exams, calculators will NOT be permitted, and will be announced prior to the actual exam. Periodically (about 2 per week), there will be short (about 5-10 minutes) quizzes given in class. Quiz material may come from lecture, handouts, or the worksheet. Quizzes may or may not be announced. Students who miss a quiz due to an excused absence or excused tardy must make up the quiz **before the following class meeting**. Students whose absence or tardiness is unexcused, or do not take the makeup promptly, will not be able to make up the quiz. All exams and quizzes will be closed book/notes. **Students who are absent the day of a test will take the test the following day (not during class). Additionally, students absent for the original exam will not have the multiple choice section. These questions will now be short answer questions.** Students who are absent the class before a test will still take the test on the regularly scheduled day. **There will be no points given back for test corrections**, although it is always to a student’s advantage to review and correct errors. No partial exams will be given.

### **Use of Graphing Calculator**

Instruction will be given using TI-84. The graphing calculator will be used regularly in class as a learning tool. The graphing calculator allows the student to make calculations using tedious numbers, support their work graphically, make conjectures regarding the behavior of functions and limits among other topics thus allowing students to view problems in a variety of ways.

The calculator helps students develop a visual understanding of the material. Students will master the most basic skills on the calculator: graphing a function with an appropriate window, finding roots and points of intersection, finding numerical derivatives and approximating definite integrals. **Students are encouraged to purchase their own calculator**, but a class set is also available during class. A student ID must be exchanged for the in-class use of the calculator.

Most homework problems are clearly identified as being “calculator allowed” or “non-calculator” problems. Students are encouraged to develop a clear sense of when it is appropriate to use a calculator and when a calculator is not appropriate. Tests will sometimes be divided into calculator and non-calculator sections.

### **Multiple Approaches**

Throughout the course, students are required to use multiple approaches to the understanding of functions. Students make daily use of the graphing calculator. Graphs are produced both with the calculator and by hand to assist in the understanding of problems. Students use the graphing calculator to experimentally determine solutions to problems and to interpret the results. Students also learn to use the calculator to support answers and conclusions that they have developed analytically.

Numerical solutions are developed both manually and with the calculator. Students are encouraged to check the reasonableness of their numerical solutions by using other approaches.

Students use analytical techniques to solve applied problems in differential and integral calculus. They are encouraged to develop general analytical approaches that can be applied to non-traditional problems.

Students will be asked to explain Precalculus problems and techniques verbally and in writing, and each exam contains a writing prompt. Students are encouraged to form study groups outside of class to work on homework and prepare for exams.

### **Grading**

1. Exams—60% of the cycle grade
2. Quizzes and Daily Work—30%
3. Daily Practice (like homework)—10%, graded for completion
4. Final exam—10% of semester grade (3 cycle average is 90% of semester grade.)

### **Academic Integrity and Honesty**

Discussion of homework or assignments among students aids learning and is encouraged. However, each student is expected to submit his/her own work. No two homeworks should ever be identical on any major part. Copying DOES NOT EQUAL cooperation!!!!!! No cooperation of any kind, or use of unauthorized notes, is allowed during examinations and quizzes. Academic dishonesty in any portion of the academic work for this course shall be grounds for awarding a failing grade for that assignment and a written office referral.

Cheating, particularly on examinations, hurts students who are honestly earning their grades by devaluing their achievements. It is every student's responsibility to help control academic honesty by reporting it to me whenever they see it going on.

Scholastic dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; copying another's homework assignment; sharing information relating to quizzes and/or exams to groups who have yet to take them; taking, acquiring, or using test materials without faculty permission; If you have any questions regarding the expectations for a specific assignment or exam, please ask.

### **Classroom Conduct**

Students are expected to interact with me and other students with respect and courtesy. In turn, I will treat you the same way. Students should attend every class session prepared to learn and work. You will soon discover that missing one day can put you at a real disadvantage because of the brisk pace of a PreAP course and since the material is generally new to you and builds upon itself. Consequently, active participation in class is expected, which includes both speaking up and listening. Give class your full attention while here. Complete all assignments, including the pre-reading, in a timely fashion. Do not bring cell phones or recording equipment to class (or have them off and out of sight.) A student whose behavior is disruptive either to me or to other students will be asked to leave the room, will be written up, and held in very low esteem.

*PLEASE FEEL WELCOME TO SEE ME OUTSIDE OF THE CLASS, ANY TIME, IF YOU HAVE QUESTIONS, PROBLEMS, OR COMMENTS PERTAINING THE COURSE WORK.*

## **MATERIAL COVERED**

### **Precalculus Prerequisites**

Numbers, Notation, & Exponents  
Agility, Simplifying, & Evaluating  
Coordinate Geometry, Equations, & Lines  
Complex Numbers, Modeling, &  
Calculators

### **Fun and Functions**

Algebraic Domains of Functions  
Limits & Continuity  
Other Properties of Functions  
Parent Functions and Transformations  
Building Functions from other Functions

### **Polynomial and Rational Functions**

Polynomial Functions and Inequalities  
Binomial Theorem and Pascal's Triangle  
Real Zeros of Polynomial Functions  
The Intermediate Value Theorem  
Complex Zeros of Polynomial Functions  
Rational Functions & Inequalities  
Radical Functions and Power Functions

### **Exponential and Log Functions**

Exponential and Logistic Functions  
Exponential and Logistic Modeling  
Logarithmic Functions  
Properties of Logs  
Exponential and Log Equations

### **Trigonometric Functions**

Angles and Angle Measure  
Applications of Angles  
Circular Trig Functions  
Using the Unit Circle  
Sinusoids  
Applications of Sinusoids  
The Other Trig Functions  
Inverse Trig Functions  
Problem Solving with Trigonometry

### **Analytic Trigonometry**

Fundamental Identities  
Trig Proofs!!!  
Composite Identities  
Other Identities  
The Law of Sines  
The Law of Cosines & Area

### **Polar, Parametric, & Vectors**

Polar Coordinates  
Graphs of Polar Equations  
Plane Curves and Parametric Equations  
Vectors in 2-D

### **Introduction to Calculus**

The Derivative  
The Integral  
Sequences & Series

### **Conic Sections**

Circles & Ellipses w/ Applications  
Hyperbolas & Parabolas w/ Applications

## **Final Thoughts**

Many students get to PreAP Precalculus through perseverance and diligence, while others have really not had to struggle much to get here. I have discovered that the individuals who fall into the first group tend to do better in the course (at least, perhaps, initially.) Be advised that regardless of what road or what habits of math study have brought you here, you are about to embark on a challenging and rewarding journey unlike any you have expected. Much of the material covered this year, as well as my expectations for you, are entirely new to you. Growing pains are to be expected and are minimized by redoubled efforts, patience, and perseverance. Don't be that proud student who disregards this advice. As your teacher, I will challenge each of you, but I will also provide you with the instruction and extra assistance you need to rise to that challenge. In the end, though, I cannot do the work for you, and there is unfortunately no royal road to mastering the material.

Success also requires excellent class attendance and an alert, active, focused, supportive, and courteous engagement in class activities. Try to come to class rested and ready. Read the next day's topic in the text prior to class. Please try not to miss class due to other activities—I've seen too many students fall behind early, never to fully recover.

### **This course does not reward lukewarm efforts: furious activity without thought NOR natural brilliance without industry.**

Be diligent and disciplined, EVERY DAY, and you will not only succeed in this course, but you will be awakened to the fascinating world of higher-level mathematics, develop new habits of mind that will benefit you the rest of your life, and you will look upon the world with new, fresh, and curious eyes.

--Mr. Korpi

