

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

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Tutorials: Mornings, lunch period, after school until 4:30 (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.)

## Course 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 written homework assigned and due on a daily basis. Homework is due at the beginning of class without exceptions. 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. Occasionally students will be asked to present their work on the board 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 will have their questions answered by fellow “expert” students. These “expert” present the problems on the board in a step-by-step manner and verbally explain the sequence and the rationale. This usually leads to great peer discussion about alternate representations and approaches to a particular problem. For their efforts, “experts” receive bonus points on quizzes. Problem numbers should be written on the board as students walk into the room and as they turn in their homework.

### **Test Review**

Students will generally have an entire class day immediately prior to any exam where they can come with any and all specific questions, including specific problems from a quiz or homework. We will spend the period answering the questions, clarifying specific points, and discussing the format of the exam. Students will also be given some suggested review problems from the text that can be looked at on these review days. On this day, general, vague questions such as, “*I don’t get ANY of this!!*” should be addressed early and often during tutorials.

### **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. Exams will consist of both a multiple-choice and free-response section, each worth 50% of the final grade. On some exams, calculators will NOT be permitted, and will be announced prior to the actual exam. Periodically (about 4 per six weeks) there will be short (about 10-15 minutes) quizzes given in class. Quiz material may come from lecture, handouts, or the textbook. 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 and will be taken in pencil. **Students absent the day of a test will take the test the following day (not during class.) Students absent the class before a test will still take the test.** **There will be no corrections after the test has been taken**, 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 primarily the TI-83+ and the TI-89. The graphing calculator will be used daily in class as a learning tool. The graphing calculator allows the student to 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.

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—20% of semester grade (3 cycle average is 80% 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.) Students 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**

### **Chapter 1. Functions & Graphs.**

Modeling and Equation Solving; Functions and their properties; 12 basic functions; Building Functions from Functions; Graphical Transformations; Modeling with Functions.

### **Chapter 2. Polynomial, Power, and Rational Functions.**

Linear and Quadratic Functions and Modeling; Power Functions with Modeling; Polynomial Functions of Higher degree with Modeling; Real Zeros of Polynomial Functions; Graphs of Rational Functions; Solving Equations in one variable; Solving Inequalities in one variable.

### **Chapter 3. Exponential, Logistic, and Logarithmic Functions.**

Exponential and Logistic Functions; Exponential and Logistic Modeling; Logarithmic Functions and their graphs; Properties of logarithmic Functions; Equation Solving and Modeling; Mathematics of Finance.

### **Chapter 4. Trigonometric Functions**

Angles and their measures; Trigonometric Functions of acute angles; The circular functions of trigonometry; Graphs of Sine and Cosine functions; Graphs of Tangent, Cotangent, Secant, and Cosecant functions; Graphs of Composite Trigonometric Functions; Inverse Trigonometric Functions; Solving Problems with Trigonometry.

### **Chapter 5. Analytic Trigonometry**

Fundamental Identities; Proving Trigonometric identities; Sum and Difference Identities; Multiple-Angle Identities; The Law of Sines; The Law of Cosines.

## **Chapter 6. Applications of Trigonometry**

(If time permits,...) Vectors; Parametric Equations and Motion; Polar Coordinates; Graphs of Polar Equations.

## **Chapter 8. Analytic Geometry**

Conic sections and parabolas; Ellipses; Hyperbolas.

## **Chapter 10. Introduction to Calculus**

Limits; Derivatives; Integrals.

## **Chapter 9. Sequences and Series**

(If time permits,...) Infinite Sequences, Limits of Infinite Sequences, Arithmetic and Geometric Sequences, Sequences and Graphing Calculators

## **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