Precalculus (Live virtual classes 2025-26)

Instructor: Dr. Ke Shi

- Lectures: **Sundays, 12:30 - 2:00pm EST (March 15, 2026 – Aug 9, 2026)**
- Homework Review Sessions: **8:00-9:00pm EST on Tuesdays**

Location: Virtually via Zoom

Textbook and Supplementary Course Materials:

- *Lecture Notes by Dr. Shi;*
- *AoPS Precalculus and Solution Manual*
- *Worksheets in KutaSoftware.com, youtube channels.*
- *The course materials will remain accessible for additional 6 months following the final lecture.*

Course schedule (tentative)

Lecture	Date	Topic
1	3/15/2026	Trig functions Intro
2	3/22/2026	Graphs of Trig functions*
3	3/29/2026	Inverse Trig functions
4	4/5/2026	Trig identities 1
5	4/12/2026	Trig identities 2
6	4/19/2026	Establishing trig identities*
7	4/26/2026	Solving a general triangle*
8	5/3/2026	Law of Sine, Law of Cosine
9	5/10/2026	Parametric Equations
10	5/17/2026	Polar Coordinates and Polar Equations
11	5/31/2026	Complex Numbers Review
12	6/7/2026	Polar form, Exponential form of complex numbers*
13	6/14/2026	Roots of Unity*
14	6/21/2026	2D and 3D vectors, Dot Products
15	6/28/2026	Matrix Intro
16	7/12/2026	Determinants and Inverses
17	7/19/2026	Applications of determinants: Area, Volume, Cramer's Rule
18	7/26/2026	Linear Transformations
19	8/2/2026	Parametric lines in 2D and 3D coordinates system
20	8/9/2026	Cross Product, planes and distance formula

** This lecture includes unique, enriched content specially created by Dr. Shi to help students deepen their knowledge and improve their problem-solving skills.*

Holiday Breaks: No classes during the weekends on Memorial Day, 4th of July and last 3 weeks in August.

Prerequisite:

Completion of the **Introduction to Geometry** and **Intermediate Algebra** courses or similar programs is recommended to ensure that students have the necessary Algebra and Geometry skills.

Targeted Level:

For students looking to excel in school math curricula, we will cover most of the topics in the textbook to provide a comprehensive understanding of algebra. In addition, for those preparing for the AMC 12 and AIME exams, we have enriched the content in selected chapters to meet the specific requirements of the contests.

Signature Features of the Course:

The Precalculus course covers the topics of trigonometry, parametric equations, special coordinate systems, complex numbers, exponential form of complex numbers, De Moivre's Theorem, roots of unity, and geometry with complex numbers; vectors in 2D and 3D space; Intro to matrices; lines and planes in 3D space. It is intended to be beneficial for students seeking to excel in their school math curriculum as well as for those aiming to excel in math competitions. Although the course is based on the AoPS Precalculus textbook, it is differentiated by Dr. Shi's distinctive teaching style. Below are some of the hallmark features of the course and Dr. Shi's instructional approach.

- **Enhanced content beyond AoPS**

  Dr. Shi has added exclusive, enriched content to the materials covered by the AoPS book to increase the effectiveness of learning. The chapters that are particularly enhanced by the added content are marked with a star (*) symbol. This enriched content goes beyond the scope and depth of the AoPS book. It helps students establish a stronger foundation in calculus, promoting a deeper understanding of the subject matter. The enriched content can be particularly beneficial for students who aspire to set a solid foundation for the AMC 10/12 and AIME competitions. A solid foundation in Precalculus also helps students who focus on excelling in their academic studies to perform better in the subsequent more advanced courses such as Calculus.

- **Unique teaching approach at problem solving**

  Dr. Shi's teaching approach is distinctive in its emphasis on integrating various topics coherently, which simplifies complex concepts and makes them easier to grasp. Dr. Shi is especially sharp at identifying the “key” to solving difficult problems and helping students see through complex problems with ease. Moreover, he often connects the keys and offers students a bigger picture of the underlying connection of these concepts. This rare quality in math instructions can lead to significant improvement over time, as students themselves gain the ability to solve difficult problems with ease.

- **Additional support on homework assignments**

  To provide students with further support, each 1.5-hour lecture taught by Dr. Shi is followed by a 1-hour homework review session led by a teaching assistant (under Dr. Shi's guidance). This review session is intended to offer instant feedback on students' homework and provide additional assistance as needed.

Dr. Shi's Background:

Dr Shi is a highly respected mathematics professor at a top-tier (R1) research university in the US. He obtained his Bachelor's degree in Mathematics from Peking University in China and his PhD in Applied Mathematics from the University of Minnesota. Dr's Shi's exceptional talent and dedication to mathematics have been recognized throughout his academic and professional career. He began participating in math contests at the age of 10 and received numerous awards in national and international math competitions. Notably, he earned a Silver Medal in the Chinese Mathematics Olympiad (CMO), which is considered analogous to the USAMO, and a Silver Medal in the Bulgarian Mathematics Olympiad. Dr. Shi was also invited to attend the prestigious Chinese Mathematical Olympiad Program (MOP). As a result of his outstanding performance in national and international math competitions, Dr. Shi was admitted to Peking University without having to take the admission test, a rare achievement that further demonstrates his exceptional abilities in mathematics.