MATH OVERVIEW

PRE-ALGEBRA

(Davidson Explore only): Pre-Algebra is designed to prepare students for the Explore or Davidson Academy Algebra 1 course. The work emphasizes employing multiple strategies and justifying answers through clear, written and verbal communication. The course includes very little repetition or extended practice on individual concepts and instead focuses on depth of understanding. Students' problem-solving skills will be strengthened as well as the ability to manipulate rational numbers and variable expressions. Additionally, students will explore real world applications to give relevance to the skills that students are developing.

ALGEBRA I

Algebra I covers the study of direct variation, linear equations, systems of linear equations and quadratics in a problem-centered format. Students will build on previous knowledge to solve new problems and discover important mathematical concepts. This course helps students build a solid foundation for problem solving and critical thinking, as well as develop important communication and collaboration skills in mathematics.

GEOMETRY

The primary focus of Geometry is on straight lines and objects created from straight lines – triangles and other polygons, prisms, and pyramids. Circles and parabolas are introduced as well. Other key features are linear motion, in both two and three dimensions, and questions of optimization. Vectors and parametric equations are used to represent movement along straight-line paths. Problems sets include applications and other novel problem-solving situations, with continuous spiral review incorporated throughout the year, which guides students to discovery of the major concepts of the course.

DAVIDSON EXPLORE

Davidson Explore (DE) courses are offered through the Davidson Institue for Talent Development and not by the Davidson Academy. They are often taught by Davidson Academy staff.

PLACEMENT IN MATH

Placement starts with an exam in June. The results of this exam determine initial placements, but the diagnostic period and sometimes 1:1 followup with teachers is also used to determine optimal placements. Students who are interested in a 2-in-1 Math course (Alg II/PreCalc and Calc I/ Calc II) must receive teacher approval after placement testing or the diagnostic period.

GRADUATION REQUIREMENTS

Students need four core math credits of high school math for graduation.

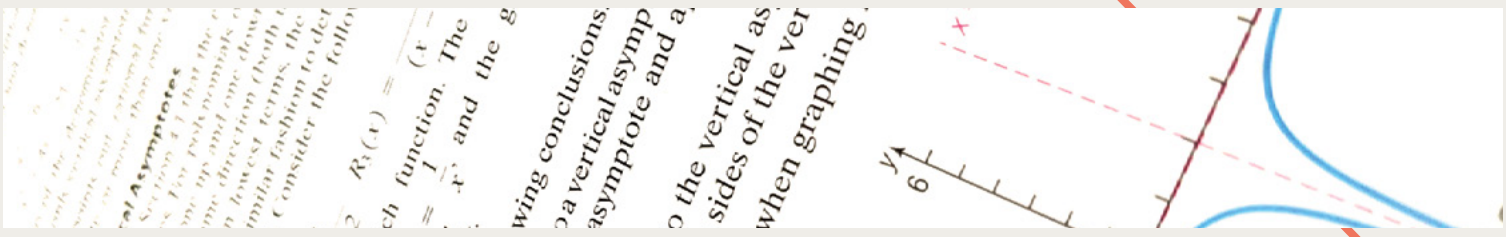
CREDIT BY EXAM

Students placed in a math class based on demonstrated knowledge of a lower level course will get a CBE. For example, if a student places into CALC I (without having had PRECALC), she will be given a CBE notation for PRECALC.

WHAT IS EXETER MATHEMATICS?

The first two DAO math courses use Exeter's math program because this curriculum teaches students mathematical thinking rather than the traditional rote-style of math. Instead of textbooks, we use challenging problem sets designed to promote curiosity, exploration, connections, accuracy, ownership, and the habit of checking for reasonability.

Students tackle problem sets and take turns sharing putting their work and explaining their thinking to the class. In this way, everyone learns a variety of techniques and approaches, gaining the confidence to tackle mathematical challenges.



ALGEBRA II

Algebra II is an in-depth study of linear, quadratic, polynomial, rational, exponential and logarithmic functions and their graphs. Students will begin their journey towards calculus by familiarizing themselves with the concepts of instantaneous rate of change, limits, and infinity. We will look at each problem numerically, graphically, and analytically to build a well-rounded understanding of the concepts that will be utilized in their journey in mathematics.

PRECALCULUS

Pre-calculus provides the foundation for a deeper investigation into differential calculus. We start with a deep dive into trigonometry, including ratio definitions, the unit circle, graphs, identities and equations, along with the Law of Sines and Law of Cosines. We extend the study of trigonometry by investigating polar coordinates and graphs and vectors. In preparation for more complex topics in calculus, the course also covers parametric equations, partial fractions, systems of inequalities, and sequences and series. The last unit begins the study of limits and derivatives, which provides an easy segue to the first topics of calculus.

ALGEBRA II/PRECALCULUS

This course is a challenging, accelerated combination of Algebra II and Pre-Calculus. Fall semester will cover Algebra II, and spring semester will cover Pre-Calculus. The course is designed for students who have strong algebra and problem-solving skills; are intrinsically motivated and highly organized; and are ready for a LOT of work.

STATISTICS

Statistics is a comprehensive, Introductory Statistics course designed to cover Data Collection, Data Presentation, Probability, Confidence Intervals, Hypothesis Testing and Correlation with Linear Regression. Because the sheer volume of material is so great, the course is designed to take an entire school year and is intended for students with a proven record of accomplishment and interest in mathematics.

CALCULUS I

Calculus covers the foundations of differential calculus, including limits, derivatives and integrals. In the beginning of the course, we examine functions and their unique behaviors, and how they relate to concepts such as limits and continuity. The rest of the course focuses on differentiation, different techniques of differentiation, and applications of derivatives. A wide range of topics are covered, including the limit definition of a derivative, chain rule, product/quotient rules, and implicit differentiation. Optimization is covered extensively, as are related rates problems and Newton's method. The course concludes with antiderivatives and integration, covering different techniques and their relationships to differentiation techniques. Areas under curves, solids of revolution, and average values are studied in detail.

"REPEATING" A COURSE

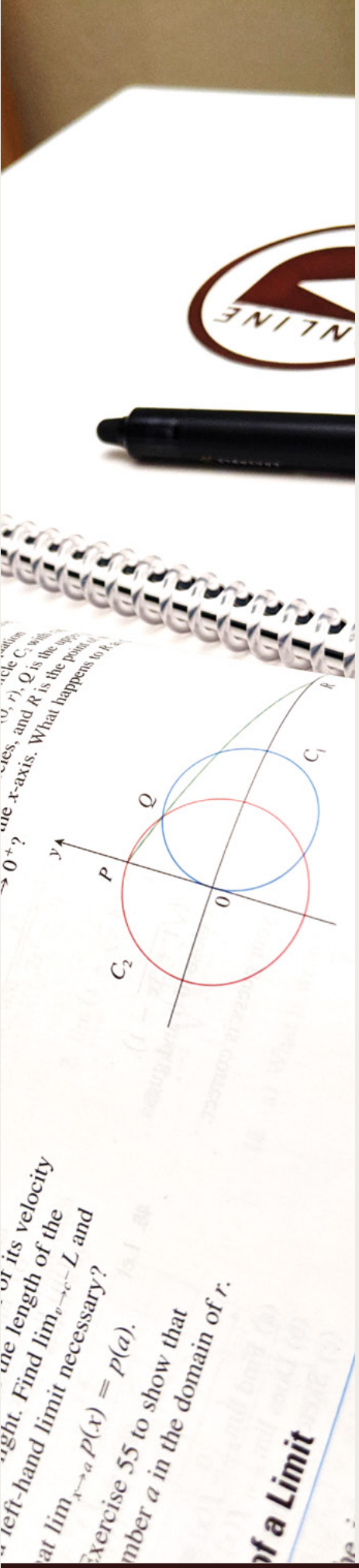
It is not unusual for students who have taken a certain level of math at another school to place into that "same" level here. That's because although the names are the same, the courses themselves can be very different. Our courses demand much higher level thinking, deeper understanding, and wider application of knowledge than most high school courses. So, even though it may seem like a step backwards, taking a course with the same name does not mean there won't be adequate challenge.

ADVANCING MORE QUICKLY IN MATH:

While we don't advise that students spend their summers studying, sometimes they do take a math course over the summer, and they are welcome to take a placement test later in the summer if they show proof of course enrollment.

COURSE PROGRESSIONS

Check out the DAO Course Progression Map to see the order in which courses are taken.



WHAT IS A FLIPPED CLASSROOM?

Many of our math classes are flipped classes in that students watch videos of the lectures and lessons at home, and then they work on the problem sets during live sessions. This allows students to review lessons as often as needed and get help from the teacher when working through problems.

CALCULUS II

Calculus II covers advanced applications and techniques of integration, differential equations, and sequences and series. The unit on sequences and series focuses primarily on tests for convergence and divergence, power series, expressing functions as power series, and Taylor/Maclaurin series. The course is intended as the second part of a sequence that begins with Calculus I.

CALCULUS I/II

Calculus I/II is an intensive course that covers that Calculus I and Calculus II curriculum in a single year. It is intended for students with a proven record of accomplishment and interest in mathematics.

CALCULUS III

Calculus III extends the concepts of single-variable calculus to multi-variable and vector-valued functions. Students explore the ideas of limit, continuity, and partial and directional derivatives. Next, students move on to the integral calculus of multivariable functions. Finally, students are introduced to vector fields, line integrals and the Fundamental Theorem of Line Integrals. More advanced topics such as Green's Theorem, Stokes' Theorem, and the Divergence Theorem conclude the course.

LINEAR ALGEBRA

Linear Algebra begins with a thorough treatment of systems of equations and their solutions using techniques of matrix algebra. This serves as a jumping off point for investigating matrices as mathematical objects in their own right. Emphasis then shifts towards widening these concepts to the notions of abstract linear transformations and abstract vector spaces. Standard topics such as Gram-Schmidt, least squares, and eigenvalues are covered, but always with an emphasis on geometric interpretation.

INTRO TO PROOFS

Intro to Proofs is designed to help bridge the wide gulf between what is expected of students in lower division math classes (e.g., the calculus sequence) and upper division math classes (e.g., analysis, group theory, topology). This course covers standard proof techniques that are essential for understanding and participating in modern mathematics: proof by contradiction, contrapositive, induction, set inclusion, etc.. In addition, the course covers the basics of logic and select topics in analysis and number theory.