MATHEMATICS DEPARTMENT

Teri Range, Department Chairperson

MATHEMATICS DEPARTMENT COURSE SEQUENCE FLOWCHART

All courses in the Mathematics Department are **year-long courses** and must be taken in sequence, beginning with the courses offered to freshmen at Milburn and progressing downward through the table. Refer to individual course descriptions for specific prerequisites.

Students may **move down and to the right** in the sequence if they **do not meet** the grade requirements for the column in which they start. Conversely, students may **move down and to the left** with an excellent grade in their current class and a teacher recommendation.

Students may enroll **concurrently in two mathematics courses** during the same semester **only under special circumstances**, as determined by the student's previous math teacher and school counselor, with department chairperson approval. **Exception:** Students do **not** need special approval to take **AP® Statistics concurrently** with **AP® Precalculus** or **AP® Calculus (AB or BC)**.

Prerequisite for AP® Statistics: Successful completion of **Advanced Algebra 2** with a grade of **C or higher**, or **Honors Algebra 2** with a passing grade. Students may—but are not required to—take a **Precalculus** course before enrolling in AP® Statistics.

	Honors Sequence	**Advanced Sequence**	**Regular Sequence**
Freshman	Honors Algebra 1 (Milburn only)	Advanced Algebra 1 (Milburn only)	Introduction to Algebra (Milburn only)
	Honors Geometry (Milburn and Smiley)	Advanced Geometry	Geometry with Algebra
	Honors Algebra 2	Advanced Algebra 2	Algebra 1
	AP® Precalculus	Advanced Precalculus w/Trig	Algebra 2
Senior	AP® Calculus BC	AP® Calculus AB	* AP® Statistics	Precalculus w/Trig	College Algebra

MATHEMATICS DEPARTMENT

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INTRODUCTION TO ALGEBRA

Full Year 1/2 credit per semester
Open to all levels
Prerequisite: None ***Remedial***

Introduction to Algebra introduces the skills and concepts of a first-year algebra course. Emphasis will be upon the skills needed to solve and graph linear equations and inequalities, solve systems of equations, and complete applications of linear equations and systems of linear equations, along with all the numerical concepts required to support these topics. The course is specifically designed to meet the needs of students requiring practice with algebra and number skills at a slower pace. Students completing both semesters of Introduction to Algebra will enroll in Geometry with Algebra.

ALGEBRA 1

NCAA

Full Year 1/2 credit per semester
Open to juniors and seniors ***General***
*Prerequisite: Pass **BOTH** semesters of Introduction to Algebra and Geometry with Algebra*

Algebra 1 is a one-year course of study of first year Algebra Topics that will build upon the student's previous knowledge of mathematics obtained in Introduction to Algebra and Geometry with Algebra. Algebra 1 will serve as a second course after Geometry with Algebra that will prepare students for course work in Algebra 2. Topics in Algebra 1 will include study of the real number line and its properties, solving linear and quadratic equations, as well as a review of how to solve systems of linear equations. Students will do work with Laws of Exponents, perform basic operations on polynomials, factor polynomials, simplify rational expressions and solve rational equations. Graphing quadratic functions, and work with probability will be undertaken. Students will also prepare for the SAT and ACT tests. Juniors who successfully complete Algebra 1 may enroll in Algebra 2.

GEOMETRY WITH ALGEBRA

NCAA

Full Year 1/2 credit per semester
Open to sophomores, juniors and seniors ***General***
Prerequisite: Completion of BOTH Semesters of Introduction to Algebra OR an equivalent introductory level Algebra course.

Geometric concepts needed for success in more advanced algebra courses will be studied. Topics, skills, and concepts previously covered in Introduction to Algebra which are relevant to work in Geometry will be reviewed and applied. Successful completion of both semesters of Geometry with Algebra will enable students to enroll in Algebra 1.

ALGEBRA 2

NCAA

Full Year 1/2 credit per semester
Open to juniors and seniors ***General***
Prerequisite: Successful completion of Geometry with Algebra and Algebra 1 OR successful completion of Advanced Algebra 1 and Advanced Geometry with recommendation by a student's most recent mathematics teacher.

Algebra 2 will serve as the final course in the Introduction to Algebra, Geometry with Algebra, Algebra 1 sequence or a third course in the Advanced Algebra 1, Advanced Geometry sequence. Students taking this course should be preparing for further study at the post secondary level. Students are strongly encouraged to have a Texas Instruments Graphing Calculator to use throughout the course. Students will examine the real number system in conjunction with set theory. Students will take knowledge from Algebra 1 and expand upon it in areas such as linear equations and inequalities, functions, and linear and quadratic functions. Students will study quadratic functions and factoring, polynomials and polynomial functions, rational exponents, and radical functions. Students will also explore new areas such as polynomial functions, exponential and logarithmic functions, trigonometric functions, and statistics. Juniors who successfully complete Algebra 2 may enroll in College Algebra with Trigonometry as seniors. Students successfully completing both semesters of Algebra 2 are **not** eligible to enroll in either Advanced Precalculus with Trigonometry or Statistics.

COLLEGE ALGEBRA

Full Year NCAA
1/2 credit per semester
Open to seniors and qualifying juniors. ***General***
Prerequisite: Completion of both semesters of Algebra 2 with a B− or below OR successful completion of both semesters of Advanced Algebra 2 with a grade of D+ or below.

College Algebra is a full year course reviewing and extending upon Algebra 2 topics. The study of functions and their graphs will be emphasized. Topics will include linear, quadratic, piece-wise, rational, polynomial, exponential and logarithmic functions. Matrix algebra and basic arithmetic of complex numbers will be new topics covered in this course. Upon successful completion of this course, students will be able to apply a variety of problem-solving strategies to find solutions to an array of real-life problems. This course will provide the algebraic skills needed to pursue higher level studies in mathematics. All students registering for this course are required to have a graphing calculator.

MATHEMATICS DEPARTMENT

Teri Range, Department Chairperson

PRECALCULUS WITH TRIGONOMETRY

Full Year NCAA
1/2 credit per semester
Open to seniors and qualifying juniors ***General***
Prerequisite: Successful completion of both semesters of Algebra 2 with a B or better OR successful completion of both semesters of Advanced Algebra 2 with a passing grade of C+ or lower. The TI-84 Graphing Calculator will be used for classroom work.

PRECALCULUS with Trigonometry is a full-year course reviewing and extending upon Algebra 2 topics. Linear, quadratic, polynomial, logarithmic, exponential, and rational functions will be studied. Application of each of these functions to real world problems will be explored. During the second semester, trigonometric functions and their applications will be introduced. Units dealing with conic sections and statistics will be covered second semester. This course will help lay a foundation for students preparing for further study at the post-secondary level. Students who have completed Honors Algebra 2 are not eligible to enroll in this course. All students registering for this course are required to have a graphing calculator.

ADVANCED MATH SEQUENCE

ADVANCED ALGEBRA 1

Full Year NCAA
1/2 credit per semester
Open to freshman ***Enriched***
Prerequisite: None

Advanced Algebra 1 is an intensive one-year course that will build upon the student's previous knowledge of mathematics by emphasizing language relating to the real number system and its properties. Topics include: expressions, equations and applications, inequalities, linear functions, linear equations and their graphs, systems of linear equations, exponents and exponential functions, polynomial operations and factoring, radical expressions, and quadratic functions. This course will also introduce the student to the TI-84 graphing calculator. It is strongly recommended that students purchase their own calculator. Successful completion of Advanced Algebra 1 (with a grade of "C" or better both semesters) prepares students for enrollment in Advanced Geometry. Students who have passed Advanced Algebra 1 with a grade less than a "C" must enroll in Geometry with Algebra the following year.

ADVANCED GEOMETRY

Full Year NCAA
1/2 credit per semester
Open to sophomores, juniors, and seniors ***Enriched***
Prerequisite: Completion of Advanced Algebra 1 with a grade of C or better BOTH semesters.

Advanced Geometry is designed to help students develop habits of clear thinking in order to make conjectures and follow a logical sequence of deductive reasoning. Students will learn about geometric relationships in both two and three dimensions: lines, planes, angles, circles, polygons, etc. will be studied. Different problem-solving techniques are introduced, and students are encouraged to use them when doing assignments. During the first semester students will focus on learning geometric concepts through constructions and transformations (most specifically of triangles). The development of logical proofs and the use of algebraic skills to solve geometric problems will also be emphasized. The focus of the second semester will be on properties and formulas related to polygons, circles, coordinate geometry, polyhedra and work in three dimensions.

ADVANCED ALGEBRA 2

Full Year NCAA
1/2 credit per semester
Open to sophomores, juniors and seniors ***Enriched***
Prerequisite: Completion of Advanced Geometry with a grade of "C" (not C-) or higher both semesters AND a grade of "C" or higher both semesters of Advanced Algebra 1 OR a grade of A (95% or higher) both semesters in Algebra 1 and the recommendation of the Algebra 1 teacher.

Advanced Algebra 2 is a full-year course designed for college-bound students. Students are required to have a Texas Instruments Graphing Calculator which will be used extensively. The course begins with a review of the real numbers system and its properties, then continues on to solving and graphing linear functions. Linear systems eventually build into some basic work with matrices. The main emphasis in the systems chapter will be linear programming. First semester ends with the study of quadratic equations and functions. Students will graph quadratic functions and solve quadratic equations using several different methods. During the second half of the school year, students will study radical functions and rational expressions, exponential and logarithmic functions, rational functions, trigonometric functions, polynomials, and polynomial functions. Students enrolling in Advanced Algebra 2 should be motivated to work. They should also possess thinking skills that allow them to make the transition to a higher, more abstract cognitive level of mathematics than previously attained. (See next page)

Students completing Advanced Algebra 2 with a passing grade of C- or less either semester will be

recommended for College Algebra with Trigonometry placement. Students completing Advanced Algebra 2 with a grade of C or higher are eligible to enroll in Descriptive and Inferential Statistics. A grade of B or higher is necessary for enrollment in Advanced Pre-Calculus with Trigonometry.

AP® STATISTICS

NCAA

Full Year 1/2 credit per semester

SLU Dual Credit Course

Prerequisite: Successful Completion of Advanced Algebra 2 with a grade of C or higher OR Honors Algebra 2 with a passing grade. ***Enriched***

AP® Statistics is a year-long course designed to prepare students for collegiate level work in probability and statistics. Descriptive Statistics is studied first semester and includes such topics as graphical displays of data, numerical descriptions of data, summarizing bivariate data, probability, random variables, and probability distributions. Inferential statistics is the focus of second semester and includes such topics as planning a statistical study, point estimation, interval estimation, and various forms of hypothesis testing. Students who enroll in AP® Statistics will be prepared to take the AP® Statistics exam in early May. An increasing number of college programs and majors are requiring some coursework in statistics and this course serves as excellent preparation for such work. Applications and case studies are provided for study throughout the course and exposure to software programs used in collegiate statistics courses as well as the Statistics features of the TI-84 and TI Nspire calculator are essential components of the course. **The TI-84 and TI Nspire Graphing Calculator will be used for all work in this course.**

ADVANCED PRE-CALCULUS WITH TRIGONOMETRY

NCAA

Full Year 1/2 credit per semester

Open to juniors and seniors ***Enriched***

Prerequisite Completion of Advanced Algebra 2 and Advanced Geometry with a grade of B- or higher both semesters in each course

Advanced Pre-Calculus with Trigonometry is a one-year course for students with a very strong background in both Algebra and Geometry who are interested in pursuing further coursework in mathematics, engineering, or the sciences. During first semester, students will study polynomial, rational, exponential, and logarithmic functions and their properties. Second semester focuses on functions of arc lengths on the circumference of the unit circle (circular functions) and their graphs, trigonometric functions, trigonometric identities, inverse trigonometric functions, and algebraic solutions of trigonometric equations. A variety of application problems from surveying and navigation will be solved using the Law of Sines and Law of Cosines. Extensive use of graphing calculator technology will be made in this course, and each student will be required to have a TI-84 model graphing calculator in their possession every day. Successful completion of this course will prepare students for a first course in Calculus.

CALCULUS

NCAA

Full Year 1/2 credit per semester

Open to juniors and seniors ***Enriched***

Prerequisite: Completion of Advanced Pre-Calculus with Trigonometry with a grade of "C"(not C–) or better both semesters.

Calculus is a course designed to introduce students to the fundamental techniques and applications of calculus. Students review important pre-calculus topics with special emphasis on limits. Techniques of differentiation and integration are studied and applied to a variety of real-life situations. Although students are required to understand the meanings and applications of both the derivative and the integral, emphasis is placed upon skills and concepts rather than on a theoretical understanding of the calculus. This course is designed to prepare students for the AP Calculus AB exam, and it serves as an excellent preparation for college level calculus courses.

HONORS MATH SEQUENCE

HONORS ALGEBRA 1

NCAA

Full Year 1/2 credit per semester

Open to freshmen ***Honors***

Prerequisite: Eligibility determined by qualifying criteria

Honors Algebra 1 is a one-year course covering the material in a typical first-year algebra course plus additional topics, all at an accelerated pace and in greater depth. Solving equations, fractions and their applications, inequalities, polynomials, linear functions, systems of equations, rational expressions and equations, quadratic functions and data alaysis are just some of the topics covered in this course. Some geometry topics are also integrated into the curriculum. The TI-84 graphing calculator is a valuable asset for this class. Each student is required to have one of these calculators in their possession for every class session. Successful completion of both semesters of this course with a grade of "B" (not B–) or higher is necessary for students to enroll in Honors Geometry as sophomores. A grade of "B–" or lower

requires that the student take Advanced Geometry the following school year. The Honors Algebra 1 teacher may recommend that those students demonstrating exceptional talent and abilities in mathematics (very high A average both semesters) "double up" and enroll in both Honors Geometry and Honors Algebra 2 during the next school.

HONORS ALGEBRA 2

NCAA

Full Year 1/2 credit per semester

Open to sophomores and juniors ***Honors***

Prerequisite: Completion of Honors Geometry with a grade of "B" (not B-) or higher both semesters OR recommendation by the Honors Algebra 1 teacher to double in Honors Geometry and Honors Algebra 2

Honors Algebra 2 is a full-year course designed for the most talented students of mathematics at this level of the curriculum. A Texas Instruments Graphing Calculator is required and will be used extensively. Significant emphasis will be placed upon the language and vocabulary in mathematics. The course begins with a study of the algebraic properties, set theory, and a review of solving linear equations and inequalities. The first semester concentrates on linear functions and their applications. Students will discover how to work with linear functions numerically, graphically and algebraically. The concept of linear functions will be extended to and applied to systems of linear functions and matrix algebra. The first semester will conclude with a study of the laws of exponents. An in-depth study of polynomial, exponential, logarithmic, and rational functions will be the major focus of the second semester. Again, students will study these functions numerically, graphically, and algebraically. Students will explore multiple problem solving strategies, applying higher level thinking skills. In addition to the study of functions, inverse functions will be introduced and their application studied. A detailed analysis of the models and graphs of conic sections will be implemented during the second semester. Finally, students will be introduced to the basic principles of probability as well as the statistical analysis of data. An abundance of real world applications will be presented throughout the year to enhance each student's appreciation and understanding of mathematics. Successful students that complete the course with a grade of "B" or better for both semesters may enroll in AP® Pre-Calculus the following year.

HONORS GEOMETRY

NCAA

Full Year 1/2 credit per semester

Open to freshmen and sophomores ***Honors***

Prerequisite: Completion of Honors Algebra 1 with a grade of "B" (not B−) or higher BOTH semesters

Honors Geometry is a one-year course intended for mathematically-talented students. The mission of the class is to develop innovative problem solvers who think critically through problems, make connections, formulate creative strategies, apply mathematical concepts, generate accurate but efficient solutions, and effectively communicate ideas through logical reasoning. Emphasis first semester is placed upon language, developing logical reasoning skills by writing proofs as well as practicing creative problem-solving techniques. During second semester, students will study similarity, right triangles, circles, area , and volume of three-dimensional figures. Admission to the course as a Freshman is by invitation only.

Note: Consent of the department chairperson is required unless the Honors Algebra 1 prerequisite is satisfied.

AP® PRE-CALCULUS

NCAA

Full Year 1/2 credit per semester

Open to juniors and seniors ***Honors***

Prerequisite: Completion of Honors Algebra 2 with a grade of "B"(not B−) or higher BOTH semesters

AP® Pre-Calculus is a one-year course for students who have demonstrated an aptitude for mathematics and have been very successful in previous Honors level mathematics classes. This mathematically rigorous course provides talented students with an environment rich in applications and problem solving. During the first semester, students will study polynomial, rational, exponential, and logarithmic functions and their properties. Emphasis second semester is placed upon trigonometric functions and their graphs as well as trigonometric identities, trigonometric equations, and the solving of triangles. The year ends with a unit on vectors, parametric functions, and conic sections. Successful completion of AP Pre-Calculus qualifies students for AP® Calculus AB the next school year, and students receiving a grade of A– or higher in AP® Pre-Calculus are eligible to enroll in AP® Calculus BC the next school year.

MATHEMATICS DEPARTMENT

Teri Range, Department Chairperson

AP® CALCULUS AB

NCAA

Full Year — 1/2 credit per semester

SLU Dual Credit Course

Honors

Prerequisite: Advanced Pre-Calculus with Trigonometry with a grade of B– or higher both semesters or successful completion of AP Pre-Calculus

AP® Calculus AB is a college-level mathematics course designed for high school students who have successfully completed pre-calculus and are ready to explore the foundational concepts of differential and integral calculus. The course focuses on three main topics: limits, derivatives, and integrals, including the Fundamental Theorem of Calculus. Students learn how to analyze and model real-world phenomena involving change using mathematical tools and representations -- graphical, numerical, analytical, and verbal. They explore the meaning and application of derivatives as rates of change and slopes of tangent lines, and use integrals to determine area, accumulation, and total change over an interval. Emphasis is placed on conceptual understanding, proper use of mathematical notation, and justification of results. Technology, particularly graphing calculators, is integrated throughout to enhance problem-solving and deepen insight. Designed for students with a strong foundation in algebra, geometry, and pre-calculus, this course prepares them for success in future STEM-related studies. AP® Calculus AB is equivalent to a first-semester college calculus course and prepares students to either take the AP® Exam for potential college credit or advanced placement or the opportunity to receive dual credit through St. Louis University.

AP® CALCULUS BC

NCAA

Full Year — 1/2 credit per semester

SLU Dual Credit Course

Honors

Prerequisite: Successful completion of AP Pre-Calculus with a grade of "A-" or higher both semesters

AP® Calculus BC is an intensive, college-level mathematics course that covers all topics in AP® Calculus AB – limits, derivatives, definite and indefinite integrals, and the Fundamental Theorem of Calculus – while extending the curriculum to include more advanced material such as parametric, polar, and vector functions, sequences and series (including Taylor and Maclaurin series), and additional integration techniques. Designed for highly motivated students with a strong mathematical foundation, AP® Calculus BC moves at a faster pace and demands a deeper level of analytical thinking and conceptual understanding than AP® Calculus AB. Students use multiple representations – graphical, numerical, analytical, and verbal – to solve problems and justify solutions, while developing fluency in mathematical communication and use of technology. This course is equivalent to the first two semesters of college calculus. Just like with AP® Calculus AB, students may receive dual credit for Calculus 1 only through St. Louis University.Students wishing to earn college credit may also take the AP® Calculus BC exam for potential college credit for Calculus 1 and Calculus 2.