

# MATHEMATICS (MATH)

## MATH 120 INTERMEDIATE ALGEBRA 3 Credits (3)

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## MATH 1130G Survey of Mathematics 3 Credits (3)

This course will develop students' ability to work with and interpret numerical data, to apply logical and symbolic analysis to a variety of problems, and/or to model phenomena with mathematical or logical reasoning. Topics include financial mathematics used in everyday life situations, statistics, and optional topics from a wide array of authentic contexts.

**Prerequisite(s):** adequate scoring on the Mathematics Placement Exam, or any ACT/SAT and GPA combination that is considered equivalent, or a C- or better in CCDM 113 N or CCDM 114 N

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## MATH 1134 Fundamentals of Elementary Mathematics I 3 Credits (3)

Numbers and the four operations of arithmetic. Understanding and comparing multiple representations of numbers and operations, in particular how these representations build from whole numbers to integers to fractions and decimals. Applying properties of numbers and operations in contextual situations. Reasoning, communicating, and problem solving with numbers and operations. Applications to ratio, and connections with algebra. Taught primarily through student activities and investigations.

**Prerequisite(s):** adequate scoring on the Mathematics Placement Exam, or any ACT/SAT and GPA combination that is considered equivalent, or a C- or better in MATH 1215 or higher. Restricted to: EDUC, EPAR, E ED, ECED majors

### Learning Outcomes

1. As future elementary teachers you will be teaching mathematics to children.
2. In order to teach a subject well you need not only to know the material that you will teach, but you need to know more than what you will teach, and know it well, in order to be able to answer questions, understand student reasoning, give alternate explanations when your students do not understand something, and be able to adjust to changes in the mathematical curriculum.
3. Furthermore, even if you hope to teach a given grade, you should be prepared to teach a variety of grades since what a person ends up teaching is often not what they planned to do.
4. We will explore ideas of arithmetic in a way to help you improve your mathematical ability, gain confidence in your ability, introduce to you different ideas and models, and to see a variety of mathematical activities that are appropriate for people of all ages.
5. Everything we study will be done with the aim of developing your ability to relate to the mathematics of elementary school and to help children develop mathematical understanding.

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## MATH 1215 Intermediate Algebra 3 Credits (3)

A study of linear and quadratic functions, and an introduction to polynomial, absolute value, rational, radical, exponential, and logarithmic functions. A development of strategies for solving single-variable equations and contextual problems.

**Prerequisite(s):** adequate scoring on the Mathematic Placement Exam, or any ACT/SAT and GPA combination that is considered equivalent, or a C- or better in CCDM 113 N or CCDM 114 N

### Learning Outcomes

1. Demonstrate appropriate use of basic function language and notation.
2. Convert between equivalent forms of algebraic expressions.
3. Solve single-variable equations of the types listed above.
4. Interpret and communicate algebraic solutions graphically and numerically.
5. Demonstrate contextual problem-solving skills that include setting up and solving problems and interpreting solutions in context.
6. Apply appropriate problem-solving methods from among algebraic, graphical, and numerical.

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## MATH 1217 General Supplemental Instruction I 1 Credit (1)

Collaborative workshop for students enrolled in Intermediate Algebra.

Graded: S/U Grading. (2P).

**Corequisite(s):** MATH 1215

### Learning Outcomes

1. Implement study skills specific to mathematics by being able to identify, define, memorize, and analyze key terms and concepts.
2. Create and use math study guides and other visual aids.
3. Apply study skills to master concepts introduced in MATH 121
4. Utilize technology such as "My Math Lab" and other software programs in order to support learning in MATH 121

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## MATH 1220G College Algebra 3 Credits (3)

The study of equations, functions and graphs, reviewing linear and quadratic functions, and concentrating on polynomial, rational, exponential and logarithmic functions. Emphasizes algebraic problem solving skills and graphical representation of functions.

**Prerequisite(s):** adequate scoring on the Mathematics Placement Exam, or any ACT/SAT and GPA combination that is considered equivalent, or a C- or better in MATH 1215 or higher

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**MATH 1221 General Supplemental Instruction II 1 Credit (1)**

Collaborative workshop for students enrolled in College Algebra. Graded: S/U Grading (S/U, Audit). (2P)

**Corequisite(s):** MATH 1220G

**Learning Outcomes**

1. Students will be able to define and evaluate the trigonometric functions as functions of angle in both degree and radian measure using the definitions in terms of  $x$ ,  $y$ , and  $r$ ; as the ratio of sides of a right triangle; using the unit circle; using reference angles, commonly used ( $0^\circ$ ,  $30^\circ$ ,  $45^\circ$ ,  $60^\circ$ ,  $90^\circ$ ) angles and using a calculator.
2. Students will be able to solve right triangles. They will be able to draw a sketch in an applied problem when necessary.
3. Students will be able to solve non-right triangles using the law of sines and the law of cosines.
4. Students will be able to prove trigonometric identities and apply addition and subtraction, double-angle, half-angle and power reduction formulas.
5. Students will be able to graph the six trigonometric functions, their transformations and their inverses.
6. Students will be able to use algebraic methods, including the use of identities and inverses, to solve trigonometric equations and demonstrate connections to graphical and numerical representations of the solutions.
7. Students will be able to add and subtract vectors in two dimensions. They will be able to use the dot product to project one vector onto another and to determine the angle between two vectors. They will be able to solve a variety of word problems using vectors.
8. Students will be able to work with polar coordinates; this includes graphing in polar coordinates and transforming an equation with polar coordinates into one with rectangular coordinates, and vice versa.
9. Students will be able to work with the trigonometric form of complex numbers, including using De Moivre's formula.

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**MATH 1250G Trigonometry & Pre-Calculus 4 Credits (4)**

Trigonometry & Pre-Calculus includes the study of functions in general with emphasis on the elementary functions: algebraic, exponential, logarithmic, trigonometric and inverse trigonometric functions. Topics include rates of change, limits, systems of equations, conic sections, sequences and series, trigonometric equations and identities, complex number, vectors, and applications. Note: 80% of course must include 80% of Trigonometry SLOs and 80% of Pre-Calculus SLOs.

**Prerequisite(s):** adequate scoring on the Mathematics Placement Exam, or any ACT/SAT and GPA combination that is considered equivalent, or a C- or better in MATH 1220G or higher

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**MATH 1350G Introduction to Statistics 3 Credits (3)**

This course discusses the fundamentals of descriptive and inferential statistics. Students will gain introductions to topics such as descriptive statistics, probability and basic probability models used in statistics, sampling and statistical inference, and techniques for the visual presentation of numerical data. These concepts will be illustrated by examples from a variety of fields.

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**MATH 1430G Applications of Calculus I 3 Credits (3)**

An algebraic and graphical study of derivatives and integrals, with an emphasis on applications to business, social science, economics and the sciences. (2+2P)

**Prerequisite(s):** adequate scoring on the Mathematics Placement Exam, or any ACT/SAT and GPA combination that is considered equivalent, or a C- or better in MATH 1220G or higher

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**MATH 1435 Applications of Calculus I 3 Credits (3)**

Intuitive differential calculus with applications to engineering.

**Prerequisite(s):** C- or better in MATH 1250G

**Learning Outcomes**

1. Find limits algebraically and graphically and use limits to analyze continuity.
2. Find the derivative of a function by applying appropriate techniques (limit of the difference quotient, general derivative rules, product rule, quotient rule, chain rule, and higher order derivatives).
3. Learn derivative rules for polynomial, exponential, logarithmic, trigonometric and inverse trigonometric functions.
4. Perform implicit differentiation. Use implicit differentiation to solve related rate application problems.
5. Find the maxima, minima, points of inflections, and determine concavity of a function by applying the first and second derivatives. Use these results to sketch graphs of functions and to solve optimization problems in context.
6. Find partial derivatives and find maxima, minima in three dimensions.
7. Find the linear approximation of a function.
8. Find Maclaurin and Taylor series.
9. Find limits via L'Hospital's rule. 1
10. Communicate mathematical information using proper notation and verbal explanations.

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**MATH 1440 Applications of Calculus II 3 Credits (3)**

Topics in this second course of Applications of Calculus include functions of several variables, techniques of integration, an introduction to basic differential equations, and other applications.

**Prerequisite(s):** C or better in MATH 1435 or in MATH 1521G, or in MATH 1521H

**Learning Outcomes**

1. Find definite and indefinite integrals using integration by parts, integral tables, and numerical integration.
2. Analyze multivariable functions using partial derivatives and double integrals, and apply these techniques to applications such as optimization, least squares, and volumes.
3. Solve differential equations graphically, numerically, and algebraically using separation of variables, and apply differential equations in context.
4. Apply differentiation and integration to other areas, for example to Taylor polynomials and Taylor series, probability, trigonometric functions, etc.

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**MATH 1511G Calculus and Analytic Geometry I 4 Credits (4)**

Limits and continuity, theory and computation of derivatives, applications of derivatives, extreme values, critical points, derivative tests, L'Hopitals Rule.

**Prerequisite(s):** adequate scoring on the Mathematics Placement Exam, or any ACT/SAT and GPA combination that is considered equivalent, or a C- or better in MATH 1250G or higher

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**MATH 1521G Calculus and Analytic Geometry II 4 Credits (4)**

Riemann sums, the definite integral, antiderivatives, fundamental theorems, techniques of integration, applications of integrals, improper integrals, Taylor polynomials, sequences and series, power series and Taylor series. Repeatable: up to 4 credits.

**Prerequisite(s):** C- or better in MATH 1511G

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**MATH 1521H Calculus and Analytic Geometry II Honors 4 Credits (4)**

A more advanced treatment of the material of MATH 1521G with additional topics. (3+1P)

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**MATH 1531 Introduction to Higher Mathematics 3 Credits (3)**

Logic; sets, relations, and functions; introduction to mathematical proofs.

**Prerequisite(s):** C- or better in MATH 1521G or MATH 1521H

**Learning Outcomes**

1. The primary objective of this course is to serve as a bridge between the calculus courses you have taken, where the focus is on computations and solving problems, to more abstract mathematics courses.
2. In particular, we will discuss logical reasoning, definitions, proofs, and certain basic building blocks such as sets, functions, and relations.
3. By the end of the course, you should be able to understand and construct well-written proofs of basic mathematical arguments involving simple properties of the real numbers, integers, sets, functions, and relations using universal and existential quantifiers, absolute values and inequalities, modular arithmetic, and proof by induction.

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**MATH 1996 Topics in Mathematics 1-3 Credits**

Topics to be announced in the Schedule of Classes. Repeatable: Maximum of 3 credits per semester. Up to 6 credits.

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**MATH 2134G Fundamentals of Elementary Math II 3 Credits (3)**

Geometry and measurement. Multiple approaches to solving problems and understanding concepts in geometry. Analyzing and constructing two- and three-dimensional shapes. Measurable attributes, including angle, length, area, and volume. Understanding and applying units and unit conversions. Transformations, congruence, and symmetry. Scale factor and similarity. Coordinate geometry and connections with algebra. Reasoning and communicating about geometric concepts. Taught primarily through student activities and investigations. Repeatable: up to 3 credits.

**Prerequisite(s):** C- or better in MATH 1134

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**MATH 2234 Fundamentals of Elementary Mathematics III 3 Credits (3)**

Probability, statistics, ratios, and proportional relationships. Experimental and theoretical probability. Collecting, analyzing, and displaying data, including measurement data. Multiple approaches to solving problems involving proportional relationships, with connections to number and operation, geometry and measurement, and algebra. Understanding data in professional contexts of teaching. Taught primarily through student activities and investigations. Repeatable: up to 3 credits.

**Prerequisite(s):** C- or better in MATH 2134G

**Learning Outcomes**

1. In order to teach a subject well you need not only to know the material that you will teach, but you need to know more than what you will teach, and know it well, in order to be able to answer questions, give alternate explanations when your students do not understand something, and be able to adjust to changes in the mathematical curriculum.
2. Furthermore, even if you hope to teach a certain grade, you should be prepared to teach anything between kindergarten and 8th grade.
3. You also need to be aware of where a student is coming from in order to make adjustments in their curriculum.
4. A strong elementary school teacher must understand where his/her students are headed in order to most effectively direct them there.
5. This is especially true in mathematics, where students continue to build on the concepts they learn each year.

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**MATH 2350G Statistical Methods 3 Credits (3)**

Exploratory data analysis. Introduction to probability, random variables and probability distributions. Concepts of Central Limit Theorem and Sampling Distributions such as sample mean and sample proportion. Estimation and hypothesis testing single population parameter for means and proportions and difference of two population parameters for means and proportions. Analysis categorical data for goodness of fit. Fitting simple linear regression model and inference for regression parameters. Analysis of variance for several population means. Techniques in data analysis using statistical packages.

**Prerequisite(s):** adequate scoring on the Mathematics Placement Exam, or any ACT/SAT and GPA combination that is considered equivalent, or a C- or better in MATH 1215 or higher

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**MATH 2415 Introduction to Linear Algebra 3 Credits (3)**

Systems of equations, matrices, vector spaces and linear transformations. Applications to computer science.

**Prerequisite(s):** Grade of C- or better in MATH 1521G or MATH 1521H

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**MATH 2530G Calculus III 3 Credits (3)**

Continuation of Calculus II including multivariate and vector calculus, level curves and surfaces, partial derivatives, gradient, directional derivatives, tangent planes, optimization, multiple integrals in Cartesian, cylindrical and spherical coordinate systems.

**Prerequisite(s):** Grade of C- or better in MATH 1521G

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**MATH 2992 Directed Study 3 Credits (3)**

Varies. Graded: S/U. Repeatable: for a maximum of 6 credits.

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**MATH 2996 Topics in Mathematics 1-3 Credits**

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