# Mathematics

## Degrees

Associate in Arts Degree, Mathematics

Associate in Science Degree (AS-T):
  Mathematics for Transfer

## Program Description

Each year, the list of careers demanding familiarity with basic mathematical skills grows. Environmental sciences, architecture, business management, nursing, dentistry, computer programming, electronics, forestry management, psychology and photography represent only a small sample from this list.

The Mathematics Department at Santa Barbara City College offers a broad curriculum to meet the needs of students with a wide variety of goals. It offers a standard college-level sequence in single and multivariable calculus, analytic geometry, linear algebra and ordinary differential equations for freshman and sophomore students who plan to transfer to four-year colleges or universities. In addition, the department offers courses in statistics and calculus for Business, Biological Sciences and Social Science majors, as well as courses in support of Career Technical Education programs.

The department also serves students who need to improve their basic skills in mathematics, as well as students who are returning to formal education after a period away from school. The department provides a complete precalculus program, including elementary algebra, intermediate algebra, college algebra and trigonometry to review old or gain new mathematical skills. Basic math and pre-algebra courses provide an opportunity for students to refresh their arithmetic skills in order to participate in their educational endeavors.

In all of the department's course offerings, there is a strong commitment to training the student in analytical and logical thinking skills as part of a problem-solving attitude which can be transferred outside the formal educational setting.

The Mathematics Department offers an AS-T Degree in Mathematics for Transfer. This degree provides the foundational knowledge in Mathematics to students who want to earn a Baccalaureate Degree in Mathematics. This degree is in compliance with the Student Transfer Achievement Reform Act {Senate Bill 1440, now codified in *California Education Code* Sections 66746-66749} and guarantees admission to a California State University (CSU) campus for any community college student who completes an "associate degree for transfer," a newly established variation of the associate degrees traditionally offered at a California community college. Upon completion of the transfer associate degree, the student is eligible for transfer with junior standing into the California State University (CSU) system. Students will be given priority consideration when applying to a particular program that is similar to the student's community college area of emphasis. For more information on transfer degrees, visit *www.sb1440.org*.

## Program Student Learning Outcomes

1. Use symbolic, graphical, numerical and written representations to describe mathematical ideas.
2. Use mathematical reasoning to solve problems and apply a variety of problem-solving approaches to find and interpret solutions.
3. Use mathematics to model and solve problems in the sciences.
4. Use appropriate technology to enhance mathematical thinking and understanding, solve mathematical problems, and interpret their results.
5. Use the language and notation of differential and integral calculus correctly and use appropriate style and format in written work.
6. Recognize the roles of definitions, axioms and theorems, and identify and construct valid deductive arguments.

## Department Offices

Sarianna Fry, *Secretary* (IDC-317, ext. 2340)
*Math Tutorial Lab and Computer Lab:*
Allison Chapin, *Coordinator* (IDC-102, ext. 2300)
Math Computer Lab (IDC-109, ext. 2473)
Math Tutorial Lab (IDC-102, ext. 2300)
Marilynn Spaventa, *Dean* (A-113, ext. 2539)

## Faculty and Offices

Anna Parmely, *Chair* (IDC-331, ext. 4720)
Ignacio Alarcon (IDC-344, ext. 2559)
Lindsey Bramlett-Smith (IDC-343, ext. 2777)
James Campbell (IDC-328, ext. 2340)
Lee Chang (IDC-328, ext. 3683)
Elizabeth Cunningham (IDC-327B, ext. 2340)
Robert M. Elmore (IDC-341, ext. 2447)
Peter Georgakis (IDC-346, ext. 2553)
Pamela Guenther (IDC-336-A, ext. 2707)
David Gilbert (IDC-345, ext. 2208)

Jared Hersh (IDC-327B, ext. 2340)

James Kruidenier (IDC-339, ext. 2682)

Noureddine (Eddie) Laanaoui (IDC-330, ext. 4748)

Jennifer Loftus (ECOC3-4, ext. 2468)

Sharareh Masooman (IDC-336B, ext. 2472)

Jason Miner (IDC-342, ext. 2267)

Bronwen Moore (IDC-337, ext. 3432)

Peter Rojas (IDC-340, ext. 2737)

Ron Wopat (IDC-338, ext. 2708)

## AA Degree: Mathematics
### Department Requirements (35-36 units)
CIS 209 — Visual Basic.NET Programming *or* ...................4
   CS 120 — Java Programming *or* ......................................3
   CS 131 — Assembly Language Programming *or* ............4
   CS 135 — Programming Fundamentals *or* ......................3
   CS 137 — C Programming *or* ..........................................3
   CS 140 — Object-Oriented Programming Using C++ ......4

MATH 150 — Calculus with Analytic Geometry I.................5

MATH 160 — Calculus with Analytic Geometry II................5

MATH 200* — Multivariable Calculus..................................4

MATH 210* — Linear Algebra ............................................4

MATH 220* — Differential Equations ..................................4

PHYS 121 — Mechanics of Solids and Fluids.....................5
PHYS 122 — Electricity and Magnetism *or*.........................5
   PHYS 123 — Heat, Light and Modern Physics ...............5

*\*Math 250/260 will also satisfy these requirements.*

*For a Math A.A. Degree, at least one of the courses MATH 200, 210, 220 must be taken at SBCC.*

## Planning a Program of Study
The required first-year calculus and Computer Science courses are offered each semester (except possibly in summer). The Physics courses are offered sequentially, beginning each spring with PHYS 121.

Care should be taken, however, that one semester of calculus is completed before attempting the Physics sequence. It is recommended that students take courses in order. A programming language course should be taken as soon as possible because of its usefulness as a computational tool.

The mathematics major at Santa Barbara City College meets the accepted normal curriculum. However, transfer students are advised to review, in depth, the current catalogs of institutions to which they plan to transfer for additional course requirement information.

Because mathematics is such a precisely structured discipline, students who have not acquired adequate skills and understanding at one course level will find it most difficult to succeed in the next higher course. For this reason, an important part of the Mathematics Program at Santa Barbara City College is appropriate placement of students into classes to increase their chances of success in mastering course content.

Placement into a math class can occur one of three ways: (a) If students are beginning their college career and have not taken college level math classes at another accredited college or university, then they need to take one of SBCC's assessment exams. For assessment exam information and hours, call the Assessment Center at (805) 965-0581, ext. 2349 or *www.sbcc.edu/assessmentcenter*. (b) If students are transferring from another college or if have already taken college-level math classes, then they need to submit evidence of previous math courses to the Transcript Evaluation Office. For course evaluation information, go to *www.sbcc.edu/prerequisitepolicy*. (c) If students are continuing at SBCC, they should follow the appropriate sequence posted in the *Schedule of Classes*. There are several branches of the sequence, and each student should consult with a math instructor or counselor to make sure he/she has chosen the correct path for his/her educational goals.

Students are urged to take placement examinations and enroll in math classes as soon as possible. It is not wise to postpone taking required math courses. Doing so might significantly delay transfer.

## Sample Program
The following suggested program is designed for Mathematics majors contemplating transfer to the University of California or California State University systems, or comparable institutions.

### First Year
*Fall Semester*
MATH 150 — Calculus, with Analytic Geom I......................5

CHEM 155* — General Chemistry I ....................................5

ENG 110 — Composition and Reading *or*
   ENG 110H — Composition and Reading, Honors............3

CS 120 — Java Programming *or* ........................................3
   CS 131 — Assembly Programming *or* .............................4
   CS 135 — Programming Fundamentals *or*.....................3
   CS 137 — C Programming *or* .........................................3
   CS 140 — C++ Programming *or*......................................4
   CIS 209 — Visual Basic Programming.............................4

*Spring Semester*

MATH 160 — Calculus, with Analytic Geom II......................5

CHEM 156* — General Chemistry II...................................5

ENG 111 — Critical Thinking Through Lit *or*
    ENG 111H — Critical Think Through Lit, Honors.............3

PHYS 121 — Mechanics of Solids and Fluids......................5

**Second Year**
*Fall Semester*

MATH 200 — Multivariable Calculus..................................4

MATH 210 — Linear Algebra.............................................4

Social Science/Humanities

*Spring Semester*

MATH 220 — Differential Equations....................................4

PHYS 122 — Electricity and Magnetism .............................5

Social Science/Humanities

## American Institutions Requirements

*CHEM 155-156 is recommended for transfer students, but not required for the Associate Degree. Another elective course can be selected in its place.

## Preparation for Transfer

Course requirements for transfer vary depending upon the college or university a student wishes to attend. Therefore, it is *most important* for a student to consult with his/her counselor and departmental adviser before planning an academic program for transfer. Information sheets for majors, outlining transfer requirements, are available in the Counseling Center and the Transfer Center.

## College Requirements

For complete information, see "Graduation Requirements" in the *Catalog* Index.

## Requirements for AS-T Degree— Mathematics for Transfer

The field of mathematics covers a wide range of topics. The major is designed to give students exposure to basic information in the discipline and provide the opportunity to focus on the areas that best suit their individual needs. Students should consult with a departmental adviser and/or counselor when choosing both controlled and general electives in order to develop a program of study that is best suited to their specific needs. For example, requirements for

the baccalaureate degree in Mathematics vary from one institution to another. It is, therefore, essential to become familiar with the requirements of the institution a student plans to attend.

The Associate in Science Degree in Mathematics for Transfer will provide the foundational knowledge to students who want to earn a Baccalaureate Degree in Mathematics at any of the CSU campuses.

**Degree Requirements**
Complete 60 CSU-transferable units including General Education, major requirements and CSU-transferable electives as follows:

## I. General Education
*Complete one of the following patterns:*
  • Intersegmental General Education Transfer Curriculum "IGETC" for CSU (34-40 semester units)
  • California State University General Education Breadth pattern (39 semester units)

**II. Major**
Complete 21-23 units as outlined below with a "C" or better in each course. Pass/No Pass grading is not permitted in a course within a student's major area of study. The courses completed for the major may also be used to fulfill General Education areas on the IGETC or the CSU GE Breadth.

*Required Core (14 units)*

MATH 150* — Calculus with Analytic Geometry I ...............5

MATH 160* — Calculus with Analytic Geometry II ..............5

MATH 200* — Multivariable Calculus..................................4

*List A. Choose at least one of the following (4 units):*

MATH 210* — Linear Algebra ............................................4

MATH 220* — Differential Equations ..................................4

*List B. Choose one of the following (3-5 Units):*

Any course not taken in List A *or*

CS 120 — Java Programming.............................................3

CS 135 — Programming Fundamentals..............................3

CS 137 — C Programming..................................................3

CS 140 — Object-Oriented Prog, Using C++ ......................4

CS 143 — Discrete Math...................................................4

CS 145J — Introduction to Data Structures *or*...................3

CS 145P — Introduction to Data Structures........................3

MATH 117* — Elementary Statistics *or*..............................4

MATH 117H* — Elementary Statistics, Honors *or* ...........4

PSY 150* — Statistics for Behavioral Science ................4

PHYS 121* — Mechanics of Solids and Fluids ...................5

*These courses fulfill an IGETC and/or a CSU GE Breadth pattern requirement. Visit *www.assist.org* or *http://articulation. sbcc.edu* for IGETC and CSU GE Breadth requirements.

### III. CSU Transferable Electives

Complete as many units as needed to reach a total of 60 CSU-transferable units (for a list of SBCC-transferable courses to CSU, visit *www.assist.org*).

### Additional Graduation Requirements for AS-T in Mathematics:

- Maintain a cumulative CSU-transferable GPA of 2.0.
- Residency Requirements: Candidates for an Associate Degree are expected to complete 15 semester units in residence at SBCC. Candidates for an Associate Degree are also expected to complete at least 20% of the department major requirements in residence at SBCC.

## Mathematics Courses

### MATH 001 — Basic Mathematics
**(3)**
*Hours: 54 lecture*

Basic math course, including place value, reading and writing numbers; arithmetic operations on whole numbers; fraction concepts and operations on fractions; decimal concepts an operations on decimals; ratio and proportion; percentage; U.S. and metric systems of measurement; numerical geometry; graph reading; operations on signed numbers. Application of arithmetic to everyday life (word problems) is emphasized throughout the course.

### MATH 001N — Study Skills In Math
**(1)**
*Skills Advisories: Eligibility for ENG 100 and 103*
*Hours: 18 lecture*

Topics designed to increase student success in mathematics.

### MATH 004 — Pre-Algebra
**(3)**
*Prerequisites: MATH 1 with a "C" or better or qualifying score on SBCC placement exam.*
*Hours: 54 lecture*

Introduction to algebra: signed numbers, exponents, roots, evaluation of algebraic expressions, simplification of algebraic expressions, translation from English to algebra, solution of linear equations.

### MATH 041 — Fundamentals in Mathematics and Pre Algebra
**(5)**
*Skills Advisories: Eligibility for ENG 100 and 103*
*Hours: 90 lecture*

Foundational course, including language development, place value; definitions, concepts and operations on whole numbers, fractions, decimals, ratios, proportions, percentage and signed numbers; U.S. and metric measurement systems; introduction to algebra, rules of exponents, roots, evaluation and simplification of algebraic expressions; solving linear equations, basic polynomial factoring, and introduction to graphing. Application/word problems throughout the course.

### MATH 070 — Reading and Writing in Mathematics
**(1)**
*Prerequisites: MATH 4*
*Hours: 18 lecture*

Course for students to develop strategies for reading and writing to learn mathematics.

### MATH 074 — Pre-Algebra Refresher
**(1)**
*Hours: 18 lecture*

Short course intended for those students who have assessed into MATH 4 and wish to improve their assessment level; those who have successfully completed MATH 4 but need more review; or students who unsuccessfully attempted MATH 100 and need review of prealgebra skills. Features a computer program to refresh those concepts identified as needed for each student, plus weekly contact with the instructor. Successful completion of this course may serve as a petition to challenge MATH 4. Course does not replace a failing grade in MATH 4.

### MATH 080 — Elementary Algebra Refresher
**(1)**
*Hours: 18 lecture*

Short course intended for those students who have assessed into MATH 100 and wish to improve their assessment level; those who have successfully completed MATH 100 but need more review; or students who unsuccessfully attempted MATH 107 and need review of elementary algebra skills. Features a

computer program to refresh those concepts identified as needed for each student, plus weekly contact with the instructor. Successful completion of this course may serve as a petition to challenge MATH 100. Course does not replace a failing grade in MATH 100.

### MATH 087 — Intermediate Algebra Refresher
**(1)**
*Hours: 18 lecture*

Short course intended for those students who have assessed into MATH 107 and wish to improve their assessment level; those who have successfully completed MATH 107 but need more review; or students who unsuccessfully attempted MATH 120 and need review of intermediate algebra skills. Features a computer program to refresh those concepts identified as needed for each student, plus weekly contact with the instructor. Successful completion of this course may serve as a petition to challenge MATH 107. Course does not replace a failing grade in MATH 107.

### MATH 090 — Orientation to Mathematics Assessment
**(0.2)**
*Hours: 3.6 lecture*

Orientation to math assessment at SBCC. Four testing levels are reviewed. Discussion of test-taking strategies. Supervised practice testing in a test-like situation.

### MATH 100 — Elementary Algebra
**(5)**
*Prerequisites: MATH 4 or 41 with a "C" or better or qualifying score on SBCC placement exam.*
*Skills Advisories: Eligibility for ENG 100 and 103*
*Hours: 90 lecture*

Beginning algebra, similar to a standard first-year high school algebra course. Includes a review of signed numbers and their properties, equations and inequalities in one variable, graphing linear equations, systems in two variables, integer exponents, rational and polynomial expressions, quadratic equations, the quadratic formula, and graphing parabolas.

### MATH 100N — Study Skills in Mathematics
**(1)**
*Corequisites: MATH 100*
*Skills Advisories: Eligibility for ENG 100 and 103*
*Hours: 18 lecture*

Topics designed to increase student success in mathematics. *Note: MATH 100N to be taken as a corequisite for a specified section of MATH 100. (See Schedule of Classes for the specific section).*

### MATH 103 — Nursing and Allied Health Math
**(1)**
*Once every three semesters, excluding Summer*
*Prerequisites: MATH 4 with a minimum grade of "C" or better or qualifying score on SBCC placement exam*
*Hours: 18 lecture*

Designed for Nursing and Allied Health professionals, focuses on math skills necessary to be successful in an Allied Health occupational area. After reviewing basic math skills and algebra, students learn metric system conversions, conversion among and between the metric, apothecary and household units of measure, and computational methods used in the preparation of medications.

### MATH 104 — Elementary Algebra/ Intermediate Algebra with Study Skills
**(10)**
*Prerequisites: MATH 4 with a minimum grade of "C" or better or qualifying score on SBCC placement exam*
*Skills Advisories: Eligibility for ENG 100 and 103*
*Hours: 180 lecture*

Beginning algebra and intermediate algebra with study skills, including linear, quadratic, polynomial, rational, radical, exponential and logarithmic expressions and equations. Systems of equations in two variables, inequalities, functions, variation; and introduction to graphing calculators.

### MATH 107 — Intermediate Algebra
**(4)**
*Prerequisites: MATH 100 with a "C" or better or qualifying score on SBCC placement exam.*
*Skills Advisories: Eligibility for ENG 100 and 103*
*Hours: 72 lecture*

Second course in algebra, including algebraic manipulation of polynomials, rational expressions, exponents, radicals, linear equations, ratio and proportion, inequalities, word problems, quadratic equations, systems of linear and quadratic equations. An introduction to functions and nonlinear equations. Exponential and logarithmic functions and their applications.

### MATH 107N — Study Skills in Intermediate Algebra
**(1)**
*Corequisites: MATH 107 (concurrent)*
*Skills Advisories: Eligibility for ENG 100 and 103; proficiency in MATH 100*
*Hours: 18 lecture*

Topics to increase student success in intermediate algebra.

### MATH 108 — Math for Elementary Teachers
**(4) — CSU, UC**
*Prerequisites: MATH 104 or 107 or 111 with a "C" or better or qualifying score on SBCC placement exam.*
*Skills Advisories: Eligibility for ENG 100 and 103*
*Hours: 72 lecture*

Recommended for prospective and in-service elementary school teachers. Mathematical investigations involving sets, number sense, integers, rational numbers and real numbers.

### MATH 111 — Intermediate Algebra for Math, Science and Business Majors
**(5)**
*Prerequisites: MATH 100 with a "C" or better, or qualifying score on SBCC placement exam.*
*Skills Advisories: Eligibility for ENG 100 and 103*
*Course Advisory: MATH 100 with a "B" or better.*
*Hours: 90 lecture*

Second course in algebra, including algebraic manipulation of polynomials, rational expressions, exponents, radicals, linear equations, ratio and proportion, inequalities, word problems, complex numbers, quadratic equations, and systems of linear and nonlinear equations. Introduction to functions and nonlinear equations. Exponential and logarithmic functions and their applications. Introduction to graphing calculators.

### MATH 114 — Mathematics for Liberal Arts Majors
**(4) — CSU, UC**
*Prerequisites: MATH 104 or 107 or 111 with a "C" or better or qualifying score on SBCC placement exam.*
*Skills Advisories: Eligibility for ENG 100 and 103*
*Hours: 72 lecture*

Intended to broaden students' understanding of methods, history and applications of mathematics. Logic, mathematical proofs, numeration systems, modular arithmetic, coordinate geometry and graphing, elementary probability and statistics, linear programming and financial math.

### MATH 117 — Elementary Statistics
**(4) — CSU, UC\***
*Prerequisites: MATH 104 or 107 or 111 with a "C" or better or qualifying score on SBCC placement exam.*
*Skills Advisories: Eligibility for ENG 110 or 110H or 110GB*
*Hours: 72 lecture*

General Education mathematics course. Introduction to design of experiments, descriptive statistics and sampling distributions, Central Limit Theorem, statistical inference, confidence interval estimation, tests of hypotheses, correlation and linear regression, categorical variables, Chi-square distribution, one-way ANOVA, multiple comparisons procedure. *(\*UC Transfer Limit: MATH 117, 117H and PSY 150 combined: maximum credit, one course)*

### MATH 117H — Elementary Statistics, Honors
**(4) — CSU, UC\***
*Prerequisites: MATH 104 or 107 or 111 with a "C" or better or qualifying score on SBCC placement exam.*
*Skills Advisories: Eligibility for ENG 110 or 110H or 110GB*
*Limitation on Enrollment: Honors Program Acceptance*
*Hours: 72 lecture*

General Education mathematics course. Introduction to design of experiments, descriptive statistics and sampling distributions, Central Limit Theorem, statistical inference, confidence interval estimation and tests of hypotheses, correlation and linear regression, categorical variables and Chi-square distribution. One-way ANOVA, multiple comparisons procedure. *(\*UC Transfer Limit: MATH 117, 117H and PSY 150 combined: maximum credit, one course)*

### MATH 120 — College Algebra
**(4)— CSU, UC\***
*Prerequisites: MATH 104 or 107 or 111 with a "C" or better or qualifying score on SBCC placement exam.*
*Skills Advisories: Eligibility for ENG 100 and 103*
*Hours: 72 lecture*

Study of functions and their graphs, including polynomial, rational, exponential and logarithmic functions. Systems of equations and conics. *(\*UC Transfer Limit: MATH 120 and 137 combined: maximum credit, one course; MATH 120 and 138 combined: maximum credit, one course)*

### MATH 130 — Calculus for Biological Sciences, Social Sciences and Business I
**(5) — CSU, UC\***
*Prerequisites: MATH 111 or 120 with a "C" or better or qualifying score on SBCC placement exam.*
*Skills Advisories: Eligibility for ENG 100 and 103*
*Hours: 90 lecture*

Calculus of one variable, limits, continuity, differentiation, Riemann approximations, definite and indefinite integrals, introduction to integration techniques, exponential and logarithmic functions,

curve-sketching, maxima/minima problems, related rates and applications. *(\*UC Transfer Limit: MATH 130 and 150 combined: maximum credit, one course)*

### MATH 131 — Calculus for Biological Sciences, Social Sciences and Business II
### (3) — CSU, UC*
*Prerequisites: MATH 130 with a "C" or better*
*Skills Advisories: Eligibility for ENG 100 and 103*
*Hours: 54 lecture*

Techniques of integration for single and multivariable calculus, functions of several variables, partial differentiation, maxima/minima problems, differential equations and probability. Optional topics: infinite series, Taylor's Theorem and the calculus of trigonometric functions. *(\*UC Transfer Limit: MATH 131 and 160 combined: maximum credit, one course)*

### MATH 137 — Precalculus I - College Algebra and Functions
### (5) — CSU, UC*
*Prerequisites: MATH 104 or 107 or 111 with a "C" or better or qualifying score on SBCC placement exam*
*Skills Advisories: Eligibility for ENG 100 and 103*
*Hours: 90 lecture*

Short review of intermediate algebra topics, extensive treatment of functions and graphing techniques including translations, symmetries, reflections and graphs of inverse functions. Identities and conditional equations. Analysis and applications of polynomial, rational, exponential and logarithmic functions. Solving linear and nonlinear systems, using matrix algebra, and roots of higher-degree polynomials. Logic and structure of proofs. *(\*UC Transfer Limit: MATH 120 and 137 combined: maximum credit, one course; MATH 137 and 138 combined: maximum credit 5 semester units)*

*Note: MATH 137/138 precalculus sequence is equivalent to the former 140/141 precalculus sequence. Students who have passed the 140/141 sequence may not enroll in the 137/138 sequence.*

### MATH 138 — Precalculus II - College Algebra and Trigonometry
### (4) — CSU, UC*
*Prerequisites: MATH 137 with a "C" or better or qualifying score on SBCC placement exam*
*Skills Advisories: Eligibility for ENG 100 and 103*
*Hours: 72 lecture*

Advanced algebra course emphasizing analysis, graphing and applications of trigonometric functions.

Such functions are developed from circular functions. Trigonometric identities and conditional equations, as well as applications to triangles, vectors, complex numbers, parametric equations and polar coordinates. Additional topics include sequences, series and the Binomial Theorem. *(\*UC Transfer Limit: MATH 120 and 138 combined: maximum credit, one course; MATH 137 and 138 combined: maximum credit 5 semester units)*

### MATH 150 — Calculus with Analytic Geometry I
### (5) — CSU, UC*
*Prerequisites: MATH 138 with a "C" or better or qualifying score on SBCC placement exam*
*Skills Advisories: Eligibility for ENG 100 and 103*
*Hours: 90 lecture*

Limits, derivatives and integrals of algebraic, trigonometric, exponential and logarithmic functions. Differentials and applications of the derivative. Introduction to differential equations. *(\*UC Transfer Limit: MATH 130 and 150 combined: maximum credit, one course)*

### MATH 160 — Calculus with Analytic Geometry II
### (5) — CSU, UC*
*Prerequisites: MATH 150 with a "C" or better*
*Skills Advisories: Eligibility for ENG 100 and 103*
*Hours: 90 lecture*

Techniques of integration; applications of definite integrals; polar equations; sequences and infinite series; introduction to differential equations and to vectors. *(\*UC Transfer Limit: MATH 131 and 160 combined: maximum credit, one course)*

### MATH 188 — Trigonometry Refresher
### (1)
*Hours: 18 lecture*

Short course intended for students who wish to review trigonometry topics before or while taking calculus or higher courses. A computer program is used to refresh concepts identified as needed for each student, plus weekly contact with the instructor. This course is in no way intended to replace MATH 138.

### MATH 197 — Workshop for Pre-calculus
### (1)
*Prerequisites: MATH 111 or 120 with a "C" or better or qualifying score on SBCC placement exam*
*Corequisites: Concurrent enrollment in MATH 137 or 138*
*Hours: 54 lab*

Supplementary problem-solving course designed for students currently enrolled in MATH 137 or 138.

### MATH 199 — Workshop for Calculus
**(1)**

*Prerequisites: MATH 138 or 150 with a "C" or better or qualifying score on SBCC placement exam.*
*Corequisites: Concurrent enrollment in MATH 150 or 160*
*Skills Advisories: Eligibility for ENG 100 and 103*
*Hours: 54 lab*

Supplementary problem-solving course designed for students currently enrolled in MATH 150 or 160.

### MATH 199A — Workshop for Precalculus I
**(1)**

*Prerequisites: MATH 107 or 111 with minimum grade of "C"*
*Skills Advisories: Eligibility for ENG 100 and 103*
*Hours: 54 lecture*

Supplementary problem-solving course designed for students currently enrolled in Precalculus I.

### MATH 199B — Workshop for Precalculus II
**(1)**

*Prerequisites: MATH 107 or 111 with minimum grade of "C"*
*Skills Advisories: Eligibility for ENG 100 and 103*
*Hours: 54 lecture*

Supplementary problem-solving course designed for students currently enrolled in Precalculus II.

### MATH 199C — Workshop for Calculus I
**(1)**

*Prerequisites: MATH 107 or 111 with minimum grade of "C"*
*Skills Advisories: Eligibility for ENG 100 and 103*
*Hours: 54 lecture*

Supplementary problem-solving course designed for students currently enrolled in Calculus I.

### MATH 199D — Workshop for Calculus II
**(1)**

*Prerequisites: MATH 107 or 111 with minimum grade of "C"*
*Skills Advisories: Eligibility for ENG 110 or 110H or 110GB*
*Hours: 54 lecture*

Supplementary problem-solving course designed for students currently enrolled in Calculus II.

### MATH 200 — Multivariable Calculus
**(4) — CSU, UC**

*Prerequisites: MATH 160 with a "C" or better.*
*Hours: 72 lecture*

Functions of several variables, multiple integrals and applications, partial differentiation and applications, calculus of vector functions, Green's Theorem, Stokes's Theorem and Divergence Theorem.

### MATH 210 — Linear Algebra
**(4) — CSU, UC**

*Prerequisites: MATH 160 with a "C" or better.*
*Hours: 72 lecture*

Finite dimensional vector spaces, linear independence, bases, systems of linear equations, linear transformations, matrices, LU factorization, change of bases, similarity of matrices, eigenvalues and eigenvectors, diagonalization, applications, quadratic forms, symmetric and orthogonal matrices, canonical forms; and introduction to infinite dimensional vector spaces.

### MATH 220 — Differential Equations
**(4) — CSU, UC**

*Prerequisites: MATH 200 and 210 with a minimum grade of "C".*
*Hours: 72 lecture*

Introductory course in the theory and applications of ordinary and partial differential equations. Topics include constant coefficient equations, series techniques, introduction to Laplace transforms, qualitative and quantitative solutions to linear and nonlinear systems of differential equations, and separable partial differential equations.

### MATH 295 — Internship in Mathematics
**(2-4) — CSU**

*Prerequisites: MATH 107 or 111 with a "C" or better or qualifying score on SBCC placement exam.*
*Skills Advisories: Eligibility for ENG 110 or 110H or 110GB*
*Limitation on Enrollment: Completion of two courses in the Mathematics Department at SBCC prior to enrolling in an internship course.*
*Five to 10 hours weekly on-the-job experience.*
*Hours: 108-273 lab*

Structured internship program in which students gain experience in community organizations related to the discipline.