SAN DIEGO COMMUNITY COLLEGE DISTRICT
CITY, MESA, AND MIRAMAR COLLEGES
ASSOCIATE DEGREE COURSE OUTLINE

SECTION I

SUBJECT AREA AND COURSE NUMBER: Mathematics 096

COURSE TITLE: Intermediate Algebra and Geometry   **Units:** 5
Letter Grade or Pass/No Pass Option

CATALOG COURSE DESCRIPTION:

Intermediate Algebra and Geometry is the second of a two-semester integrated sequence in algebra and geometry. This course covers systems of equations and inequalities; radical and quadratic equations; quadratic functions and their graphs; complex numbers; nonlinear inequalities; exponentials and logarithmic functions; conic sections; sequences and series; and solid geometry. The course will also include application problems involving the topics covered. This course is the prerequisite for numerous collegiate level/transfer level mathematics courses.

REQUISITES:

Prerequisite:
MATH 046 with a grade of "C" or better, or equivalent or Assessment Skill Level M40

Advisory:

ENGL 043 with a grade of "C" or better, or equivalent or Assessment Skill Level W4
&
ENGL 048 with a grade of "C" or better, or equivalent or Assessment Skill Level R5

FIELD TRIP REQUIREMENTS: May be required

TRANSFER APPLICABILITY: Associate Degree Credit only and not Transferable

TOTAL LECTURE HOURS: 80 - 90

TOTAL LAB HOURS:

STUDENT LEARNING OBJECTIVES:
Upon successful completion of the course the student will be able to:

1. Solve systems of linear equations in three variables using a variety of methods, including matrices.
2. Create graphs of systems of linear inequalities in two variables and determine the solution set.
3. Simplify and perform the basic arithmetic operations on radical expressions in both radical and exponential form and solve radical equations.
4. Create graphs of nonlinear functions using various methods, including transformations.
5. Perform the basic arithmetic operations with complex numbers.
6. Solve quadratic equations including those having complex number solutions.
7. Identify and graph conic sections;
8. Solve absolute value inequalities and nonlinear inequalities in one varialble.
9. Perform basic algebra with functions, determine whether a function is one-to-one and find the inverse of a one-to-one function.

10. Use the properties of and relationship between exponential and logarithmic functions to solve a variety of application problems;

11. Determine the pattern of simple sequences, including arithmetic and geometric sequences, and use appropriate notation in expressing the closed form of the sequence.

12. Apply arithmetic and geometric sequences and their sums in solving related problems.

13. Identify three dimensional geometric figures and apply the appropriate surface area and volume formulas.

SECTION II

1. COURSE OUTLINE AND SCOPE:

A. **Outline Of Topics:**

The following topics are included in the framework of the course but are not intended as limits on content. The order of presentation and relative emphasis will vary with each instructor.

I. Systems of linear equations in more than two variables
   A. solution by substitution
   B. solution by addition
   C. solution by Gaussian elimination using matrices

II. Systems of linear inequalities
   A. graph of a linear inequality in 2 variables
   B. graph of solution set of a system of linear inequalities in 2 variables

III. Radical expressions and equations
   A. simplification of radical expressions
   B. basic arithmetic operations
   C. rational exponents
   D. solutions of radical equations
   E. application problems, including the Pythagorean Theorem

IV. Graphs of non-linear functions
   A. square root functions
   B. cube root functions
   C. quadratic functions
      1. vertex
      2. axis of symmetry
      3. intercepts
   D. exponential functions
   E. logarithmic functions
   F. transformations

V. Complex numbers
   A. basic definition and theory
   B. arithmetic operations

VI. Quadratic Equations
   A. solution by factoring
   B. solution by completing the square
   C. quadratic formula
   D. complex numbers as solutions

VII. Conic sections
   A. parabola
   B. circle
   C. ellipse
   D. hyperbola
   E. equations of conics in standard form
   F. graphs of conic sections

VIII. Inequalities in One Variable
   A. inequalities involving polynomials of degree two or greater
   B. inequalities involving rational functions
   C. absolute value inequalities
   D. representation of solutions on the number line and in interval notation

IX. One-to-One Functions
- A. identification of one to one functions using the definition
- B. identification of one-to-one functions using their graphs
- C. composition of functions
- D. definition of inverse functions
- E. determination of inverse function for a one-to-one function

X. Exponential and Logarithmic Functions
- A. definition and properties of logarithmic and exponential functions
- B. common and natural logarithms
- C. change of base formula and properties of logarithms
- D. application problems, including the appropriate use of a scientific calculator

XI. Sequences
- A. determination of patterns in sequences
- B. arithmetic sequences
- C. geometric sequences
- D. closed form notation for sequences

XII. Series
- A. partial sum formula for arithmetic series
- B. partial sum formula for geometric series
- C. infinite sum formula for convergent geometric series
- D. summation notation
- E. applications

XIII. Solid Geometry
- A. classification of three-dimensional figures
- B. surface area
- C. volume
- D. applications in geometry

B. **Reading Assignments:**
Reading assignments are required and may include but, are not limited to, the following:

I. assigned chapters in both the algebra and geometry texts covering those topics included in the course content.
II. articles from current journals, such as Math Horizons, and newspapers pertaining to applications of radical, exponential, logarithmic and geometric functions.
III. books and articles on the history and evolution of math as science and its influence on humanity.
IV. books and articles on the contributions of important mathematicians past and present.

C. **Appropriate Assignments that Demonstrate Critical Thinking:**
Critical thinking assignments are required and may include, but are not limited to, the following:

I. interpreting mathematical principles and using appropriate techniques, such as modeling to solve broader and more difficult problems than those covered in class;
II. solving a variety of application problems, such as exponential growth and decay, requiring the appropriate use of techniques and theorems learned in class.
III. making connections between exponential and logarithmic functions.

D. **Appropriate Outside Assignments:**
Outside assignments may include, but are not limited to, the following:

I. reviewing, and where necessary, rewriting class notes;
II. practicing problems from the appropriate sections;
III. writing short papers on related mathematical topics such as functions, graphing, and conic sections;
IV. completing reports on exploratory activities performed in class, such as calculator investigations;
V. preforming computer explorations and tutorials using software and/or the internet
VI. using video tapes on topics covered in the outline of topics.

E. **Writing Assignments:**
Writing assignments are required and may include, but are not limited to, the following:

I. paragraph essays describing methods of solving various types of algebra problems;
II. reports detailing the uses of matrices in science;
III. short papers on
IV. a mathematician and his/her discoveries and connections with various topics related to the course such as conic sections;
V. short papers on the circumstances under which the symbol e is used;
VI. papers on complex numbers and their applications;
VII. short paper on the mathematician who performed experiments on the Tower of Pisa and explaining the nature and conclusions of his experiments;
VIII. report on the life of Pascal and the inventions and mathematical discoveries he made.

2. METHODS OF EVALUATION:

A student's grade will be based on multiple measures of performance unless the course requires no grade. Multiple measures may include, but are not limited to, the following:

I. homework as described in appropriate outside assignments;
II. objective tests and quizzes that measure a student's ability to identify and perform basic mathematical ideas such as identifying conic sections and performing basic arithmetic operation with complex numbers;
III. subjective tests requiring clearly written mathematical solutions on such topics as solving inequalities, graphing functions and application problems;
IV. a comprehensive final exam;
V. exploratory activities such as those involving graphing calculators or computers;
VI. 1-2 page papers on topics such as the life of a mathematician or the development of a mathematical idea.

3. METHODS OF INSTRUCTION:

Methods of instruction may include, but are not limited to, the following:

* Distance Education
* Computer Assisted Instruction
* Lecture Discussion
* Audio-Visual
* Collaborative Learning
* Lecture
* Lecture-Lab Combination
* Other (Specify)
* Other methods of instruction may include: guest speakers, field trips, distance learning to include direct instructor contact for 40% of the course.

4. REQUIRED TEXTS AND SUPPLIES:
Textbooks may include, but are not limited to:

TEXTBOOKS:
1. Angel. Elementary and Intermediate Algebra, 2nd ed. Pearson Prentice-Hall, 2004, ISBN: 0131411160
2. Bittinger, Ellenbogen, Johnson. Elementary and Intermediate Algebra, Graphs and Models, 2nd ed. Pearson Addison-Wesley, 2004, ISBN: 0321127080
3. Blitzer. Introductory and Intermediate Algebra for College Students, 1st ed. Pearson Prentice-Hall, 2002, ISBN: 0130328421
4. Lial, Hornsby, McGinnis. Beginning and Intermediate Algebra, 3rd ed. Pearson Addison-Wesley, 2004, ISBN: 0321127153
5. Tussy and Gustafson. Elementary and Intermediate Algebra, 3rd ed. Brooks/Cole, 2005, ISBN: 0534419321

MANUALS:

PERIODICALS:

SOFTWARE:

SUPPLIES:
1. Ruler
2. Protractor
3. Scientific calculator
4. Graph paper
5. Student solution manual (may be optional)
6. Computer tutorial(may be optional)

ORIGINATOR: Laleh Howard

CO-CONTRIBUTOR(S) Judith Ross,Phyllis Meckstroth
DATE: 10/01/2004