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Course Outline for MATH 55

INTERMEDIATE ALGEBRA

Effective: Fall 2015

I. CATALOG DESCRIPTION:
MATH 55 — INTERMEDIATE ALGEBRA — 5.00 units

Intermediate algebra concepts, including: An introduction to functions; linear and absolute value functions; absolute value equations and inequalities; compound linear inequalities; systems of linear equations in three variables and matrix solutions; rational expressions, functions and equations; radical expressions, functions and equations; rational exponents; complex numbers; quadratic functions and equations; inverse of a function; exponential and logarithmic functions; properties of logarithms; exponential and logarithmic equations; conic sections; and systems of non-linear equations and inequalities. Multiple representations, applications and modeling with functions are emphasized throughout. May not receive credit if Mathematics 55B has been completed.

5.00 Units Lecture

Prerequisite
MATH 110 - Elementary Algebra
with a minimum grade of C
or

MATH 110B - Elementary Algebra B
with a minimum grade of C
or

Grading Methods:
Letter or P/NP

Discipline:

	MIN
Lecture Hours:	90.00
No Unit Value Lab	18.00
Total Hours:	108.00

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 1

III. PREREQUISITE AND/OR ADVISORY SKILLS:

Before entering the course a student should be able to:

A. MATH110
B. MATH110B

IV. MEASURABLE OBJECTIVES:

Upon completion of this course, the student should be able to:

A. Determine whether or not an equation, table or graph represents a function;
B. Use function notation;
C. Given a function, determine the domain and range and express them in interval notation;
D. Sketch the graphs of linear, absolute value, quadratic, rational, radical, exponential and logarithmic functions;
E. Find the inverse of an invertible function, identify its domain and range, and sketch its graph;
F. Solve compound inequalities, sketch the graph of the solution and use appropriate set and interval notation to express the solution;
G. Solve absolute value equations and inequalities and, where appropriate, sketch the graph of the solution and use set or interval notation to express the solution;
H. Simplify, add, subtract, multiply and divide rational expressions;
I. Solve rational equations;
J. Solve systems of linear equations in three variables;
K. Use matrix methods to solve linear systems;
L. Write radical expressions with rational exponents;
M. Simplify, add, subtract, multiply and divide radical expressions;
N. Simplify, add, subtract, multiply and divide expressions with rational exponents;
O. Solve equations involving radicals;
P. Add, subtract, multiply and divide complex numbers;

Q. Solve quadratic equations using either factoring, the square root property, completing the square, or the quadratic formula;
R. Discuss the possible solutions of a quadratic equation and find complex roots;
S. Solve higher order polynomial equations in quadratic form;
T. Find the composition of two functions;
U. Solve exponential equations;
V. Use properties of logarithms to simplify logarithmic expressions and solve logarithmic equations;
W. Use the relationships between exponential and logarithmic functions to solve equations;
X. Sketch the graphs of conic sections and identify key components of the graphs;
Y. Solve non-linear systems of equations and inequalities;
A@. Develop and use equations or function models to analyze and solve applied problems involving linear, quadratic, rational, radical, exponential or logarithmic expressions.

V. CONTENT:

A. Functions
   1. Definition
   2. Representations of functions
      a. Verbal
      b. Symbolic
      c. Numerical
      d. Graphical
   3. Identifying a function
   4. Domain and range
      a. Interval notation
   5. Types of Functions
      a. Linear functions
      b. Absolute value functions
      c. Polynomial functions
      d. Rational functions
      e. Radical functions
      f. Exponential functions
      g. Logarithmic functions
   6. Operations with functions
   7. Composition of functions
   8. Inverse of a function

B. Linear Functions
   1. Representations
   2. Domain and range
   3. Linear models
   4. Midpoint formula

C. Compound Linear Inequalities
   1. Solving
   2. Union and intersection
   3. Number line
   4. Interval notation

D. Absolute Value Functions
   1. Representations
   2. Domain and range
   3. Absolute value equations
   4. Absolute value inequalities

E. Review of Factoring Techniques

F. Rational Expressions
   1. Review
      a. Simplification
      b. Undefined expressions
      c. Multiplication and division with rational expressions
      d. Addition and subtraction with like denominators
   2. Addition and subtraction with unlike denominators
   3. Simplification of complex fractions

G. Rational Equations
   1. Solving
   2. Applications

H. Proportions and variation

I. Systems of Linear Equations in Three Variables
   1. Types of solutions
   2. Solving by substitution and elimination
   3. Matrix solutions
   4. Using technology (optional)
   5. Applications

J. Radical Functions
   1. Radical notation
   2. Simplifying radicals
   3. Addition, subtraction, multiplication and division of radical expressions
   4. Rational exponents
   5. Radical functions
      a. Square root functions
      b. Cube root functions
      c. Power functions
      d. Representations
      e. Domain and range
   6. Equations involving radicals
   7. The Distance Formula

K. Complex Numbers
   1. Definition
   2. Complex conjugates
   3. Addition, subtraction, multiplication and division with complex numbers
   4. Powers of i

L. Quadratic Functions
   1. Representations
   2. Domain and range

3. Graphs of quadratic functions
    a. Transformations and translation
    b. Vertex form
4. Min-Max applications with quadratic functions
5. Solution of quadratic equations
    a. Factoring
    b. Square root property
    c. Completing the square
    d. Quadratic formula
    e. Complex solutions and the discriminant
6. Quadratic inequalities
7. Equations in Quadratic Form

M. Exponential and Logarithmic Functions
1. Definitions
2. Representations
3. Exponential function base e
4. Common and natural logarithm
5. Logarithms with other bases
6. Relationship between exponential and logarithmic functions of the same base
7. Properties of logarithms
8. Exponential and logarithmic function models
9. Exponential and logarithmic equations

N. Conic Sections
1. Parabolas with horizontal axes of symmetry
2. Circles
3. Ellipses
4. Hyperbolas
5. Nonlinear systems of equations and inequalities

VI. METHODS OF INSTRUCTION:

A. **Lecture** -
B. Assigned readings in the text
C. Web-based tutorials
D. Group and individual activities in class
E. **Lab** - assignments
F. Homework

VII. TYPICAL ASSIGNMENTS:

A. Homework
1. Problems from the text should be assigned for each section covered. The number of problems assigned may vary from section to section and from instructor to instructor, but the homework assignments should include a sufficient number and variety of problems to develop both skill and conceptual understanding. A typical assignment should take an average student 1 to 2 hours for each hour in class.
2. The majority of the problems assigned should be those for which answers are readily available (e.g., from the answer appendix in the text), so that students may obtain immediate feedback on their work.
3. Homework assignments may include reading the text. Students may be asked to read sections in advance of the lecture and then to re-read them after the lecture, to reinforce important concepts and skills. An instructor may require written work in conjunction with the reading assignments (e.g., have students complete a Q & A sheet related to the assigned reading).

B. Laboratory
1. Lab assignments can be used to reinforce fundamental concepts and skills or to explore certain concepts in more depth than is possible in-class. They may be designated for individual or group work. Lab assignments are completed in the Open Math Lab where students have access to assistance with the assignments.
2. Sample lab assignment: Students explore concepts related to rational functions, their graphs and asymptotes by completing a series of problems that develop these concepts. The assignment uses realistic rational models to give meaning to the concept of asymptote.

C. In-Class
1. Collaborative learning, done in small groups of 2-4 students, can be used to introduce new concepts, build skills, or teach problem solving. Students may be asked to present their results on the board.
2. Sample collaborative learning assignment: Students explore the differences between linear, quadratic and exponential growth by developing graphical and numerical representations of these three types of functions. They create linear and exponential models showing the growth of money over time and determine which model will yield the most money.

VIII. EVALUATION:

A. **Methods**

1. Exams/Tests
2. Quizzes
3. Projects
4. Group Projects
5. Home Work
6. Lab Activities
7. Other:
    a. Examinations (in-class)
    b. Comprehensive final examination
    c. Laboratory assignments
    d. Any of all of the following at the discretion of the instructor
        1. Homework
        2. Quizzes (announced or unannounced, in-class or take home)
        3. Collaborative group activities
        4. Projects

B. **Frequency**

1. Recommend minimum of four exams plus the final
2. Homework should be assigned for each section covered
3. Recommend minimum of eight laboratory assignments over the semester
4. Number of quizzes and collaborative activities are at the discretion of the instructor

IX. TYPICAL TEXTS:

1. Rockswold, Gary K., and Terry A. Krieger *Beginning and Intermediate Algebra.* 3rd ed., Pearson/Addison-Wesley, 2013.

2. Tussy, Alan S., and R. David Gustafson *Elementary and Intermediate Algebra.* 5th ed., Brooks/Cole, 2013.
3. Martin-Gay, Elayn. *Beginning and Intermediate Algebra.* 5th ed., Pearson, 2013.

X. OTHER MATERIALS REQUIRED OF STUDENTS:

A. Scientific calculator