

Cape Cod Community College

Course Syllabus

Prepared by the Department of Mathematics

Department Chair's Signature:

Date of Departmental Approval: May 1, 2006

Division Dean's Signature:

Date approved by Curriculum and Programs:

1. **Course Number:** MAT040

Course Title: Intermediate Algebra

Text: Introductory and Intermediate Algebra, by Lial, Hornsby, Mcginnis

2. **Description:** A course in intermediate algebra designed to help prepare students for courses having a prerequisite of the equivalent of two years of secondary school algebra. Topics include: factoring, rational expressions, rational exponents and roots, quadratic functions, variation, conic sections, relations and functions, exponential functions, and the development of word problem analysis and solution. (This course does not satisfy the mathematics general education requirement.) 3 class hours.

3. **Student Learning Outcomes (instructional objectives: intellectual skills):**

Upon successful completion of course students will be able to:

- factor polynomials and solve polynomial equations
- simplify and perform operations on rational expressions and complex fractions
- solve rational equations
- apply properties of rational exponents
- simplify and perform operations with numerical radicals
- solve radical and quadratic equations
- find domain and range of a function
- graph quadratic, rational, radical, and absolute value functions
- graph linear equations and inequalities
- graph circles
- evaluate basic statistical measurements and probability
- solve application problems

4. **Credit(s):** 3 non-degree credits

5. **Required or elective:** Elective

6. **Satisfies General Education Core or Distribution Requirement:** No

7. **Prerequisite(s):** MAT030 Elementary algebra or appropriate mathematics placement score.

8. **Level of Course:** Developmental

9. **General Statement of Evaluation:** Regular quiz/homework papers, chapter/unit tests, and a final exam. Provisions are made for personalized interventions and advising throughout the course to assist students in acquiring required proficiency. A minimum final course average of 70% is required to pass. Grading yields "credit" or "no credit", or a letter grade of C- or higher. Students who remain active in the course through to

its conclusion, but fail to achieve the required level of proficiency, may at the instructor's discretion, be eligible for an R grade.

- 10. Content Outline of Course:** Please see the attached course outline. Note that more detail is available in the “Instructional Course Description” which is on file in the Division of Arts and Sciences office.

Intermediate Algebra Outline

- I. Real numbers
 - a. Sets
 - b. Operations on set of real numbers
 - c. Evaluating expressions
 - d. Properties of real numbers
 - e. Significant digits
- II. Review Factoring
 - a. Factoring trinomials
 - b. Solving quadratic equations by factoring
 - c. Applications of quadratic equations
- III. Linear Equations and Inequalities
 - a. Graphing lines in the coordinate plane
 - b. Slope of a line
 - c. Forms of linear equations
 - d. Linear inequalities and their graphs
 - e. Modeling
 - f. Interpreting linear equations
- IV. Nonlinear Equations
 - a. Solving proportions
 - b. Direct and inverse applications
- V. Exponents, Roots, and Radicals
 - a. Find roots
 - b. Rational exponents
 - c. Equations with radicals
 - d. Integral exponents
 - e. Scientific notation
- VI. Quadratic Equations and Inequalities
 - a. Solving quadratic equations by the square root property
 - b. Solving quadratic equations by completing the square
 - c. Solving quadratic equations by the quadratic formula
 - d. Formulas and applications involving quadratic equations
- VII. Additional Function Topics
 - a. Graphs of functions and relations
 - b. Transformations of graphs
 - c. Combining functions
 - d. Inverse functions
- VIII. Graphs of Nonlinear Functions and Conic Sections
 - a. Graphs of quadratic functions
 - b. Graphs of elementary functions and circles
- IX. Transcendental Functions
 - a. Exponential functions and applications
 - b. Logarithmic functions and applications
 - c. Simple trigonometric functions and applications
- X. Basic Statistics
 - a. Mean, median, and mode
 - b. Counting and permutations
 - c. Combinations
 - d. Probability
 - e. Reading charts and graphs

**MAT 040 INTERMEDIATE ALGEBRA
OUTCOMES BASED LEARNING MATRIX**

COURSE OUTCOMES	OUTCOMES ACTIVITIES
At the end of this course, students will be able to:	
Factoring polynomials and solve polynomials by Factoring.	<ol style="list-style-type: none"> 1. Factor a monomial from a polynomial. 2. Factor by grouping. 3. Factor a trinomial of the form $x^2 + bx + c$ 4. Factor a trinomial of the form $ax^2 + bx + c$ 5. Factor the difference of two perfect squares. $a^2 - b^2 = (a + b)(a - b)$ 6. Factor a perfect square trinomial. $a^2 + 2ab + b^2 = (a + b)^2$ $a^2 - 2ab + b^2 = (a - b)^2$ 7. Use multiple factoring techniques to factor completely any expression. 8. Solve equations by factoring. $ax^2 + bx + c = 0$ 9. Solve applied problems using factoring.
Apply the properties of rational exponents	<ol style="list-style-type: none"> 1. Simplify exponential expressions using: <ol style="list-style-type: none"> a. $b^n \cdot b^m = b^{n+m}$ b. $(b^n)^m = b^{nm}$ c. $(ab)^n = a^n b^n$ d. $\frac{b^n}{b^m} = b^{n-m}$ when $b \neq 0$ e. $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$ when $b \neq 0$ f. $b^0 = 1$ when $b \neq 0$ g. $b^{-n} = \frac{1}{b^n}$ when $b \neq 0$ 2. Translate between exponential and radical forms using: <ol style="list-style-type: none"> a. $b^{\frac{1}{n}} = \sqrt[n]{b}$ when n is a positive integer greater than 1 b. $b^{\frac{m}{n}} = \sqrt[n]{b^m} = (\sqrt[n]{b})^m$ when n is a positive integer greater than 1 and m is any integer.
Simplify and perform operations with radicals, and solve radical equations	<ol style="list-style-type: none"> 1. Simplify numerical radical expressions. 2. Add, subtract, and multiply numerical radical expressions. 3. Solve radical equations. 4. Solve applied problems.
Solve quadratic equations and inequalities	<p>Solve quadratic equations $ax^2 + bx + c = 0$, $a \neq 0$</p> <ol style="list-style-type: none"> 1. By factoring. 2. By quadratic formula. $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

	<ol style="list-style-type: none"> 3. Discriminant, $D = b^2 - 4ac$ 4. Solve by the square root method: $x^2 = a$ then $x = \pm\sqrt{a}$ 5. Solve by completing the square. 6. Solve applied problems.
Function definition.	1. Find domain and range of a function.
Graphs of quadratic functions	<p>Quadratic functions: $f(x) = ax^2 + bx + c$, $a \neq 0$</p> <p>If $a > 0$, the parabola opens upward. If $a < 0$, the parabola opens downward</p> <ol style="list-style-type: none"> 1. Graph a from: $f(x) = a(x - h)^2 + k$ Where vertex $x = (h, k)$ and axis of symmetry $x = h$ 2. Graph a from: $f(x) = ax^2 + bx + c$ Where vertex $(-\frac{b}{2a}, f(-\frac{b}{2a}))$ and axis of symmetry $x = -\frac{b}{2a}$
Graphs of rational, radicals, absolute value and exponential functions	<ol style="list-style-type: none"> 1. Graph rational functions: $y = \frac{1}{x}$, $x \neq 0$ 2. Graph radical functions: $y = \sqrt{x}$ where $x \geq 0$ 3. Graph absolute values functions: $y = x$
Graph Conic Sections	1. Graph circle: $(x - h)^2 + (y - k)^2 = r^2$, where the center $= (h, k)$ & $r =$ radius

Graphs of linear equations and inequalities	<ol style="list-style-type: none"> 1. Graphing Lines: $y = mx + b$ and $Ax + By = C$ 2. Finding slope (m) of a line: $m = \frac{y_2 - y_1}{x_2 - x_1}$ 3. Writing the of a line: $y - y_1 = m(x - x_1)$ or $y = mx + b$ 4. Solving linear inequalities and their graphs: $Ax + By > C$ 5. Functions and relations 6. Solve applied problems 7. Evaluate variation problems.
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Basic statistics and probability

1. Calculate the mean, median and mode.

$$\text{mean} = \mu = \frac{\sum_{i=1}^n x_i}{n}$$