

**LAST REVIEW: 2010-2011**

**NEXT REVIEW: 2015-2016**

**STATUS: A**

**COURSE TITLE: Precalculus Algebra**

**COMMON COURSE NUMBER: MAC 1140**

**CREDIT HOURS: 3**

**CONTACT HOUR BREAKDOWN**

*(per 16 week term)*

**CLOCK HOURS:**

*(Voc. Course ONLY)*

Lecture: **48**

Lab:

Clinic:

Other:

**PREREQUISITE(S): MAC 1105**

**COREQUISITE(S): None**

**PRE/COREQUISITE(S):**

**COURSE DESCRIPTION** *(750 characters, maximum):*

This course, in conjunction with MAC 1114, is designed to prepare the student for the study of calculus. Topics include sequences; series; mathematical induction; matrices; determinants; and systems of equations. Also included are polynomial, rational, exponential, and logarithmic functions and equations; and polynomial and rational inequalities. Functions and graphs are emphasized. A scientific or graphing calculator is required. Recommendation of the Mathematics Department or at least a grade of "C" in the prerequisite course is required.

General Education Requirements – Associate of Arts Degree (AA), meets Area(s): Area 5

General Education Requirements – Associate in Science Degree (AS), meets Area(s): Area 4

General Education Requirements – Associate in Applied Science Degree (AAS), meets Area(s): Area 4

## **UNIT TITLES**

- 1. Polynomial, Rational, and other Algebraic Functions, with their properties and their Graphs.**
- 2. Polynomial and Rational Equations and Inequalities**
- 3. Exponential and Logarithmic Functions, with their Properties and Graphs**
- 4. Conic Sections**
- 5. Systems of Equations and Inequalities, Matrices, and Determinants**
- 6. Mathematical Induction, Sequences, and the Binomial Theorem**

\*\*\* Complete the following only if course is seeking general education status \*\*\*

## GENERAL EDUCATION Competencies and Skills \*:

In the box to the right of the Competency/Skill, enter all specific **student learning outcome** unit numbers, as indicated in the course outline (i.e. 1.1, 2.7, 4.2, 4.0 and 5.12) that apply.

<b>Course must include <u>all</u> of the following:</b>	
<b>1. Read with critical comprehension**</b>	2.2, 2.3, 2.4, 2.9, 3.1, 3.4, 4.2
<b>2. Write clearly and coherently**</b>	1.0, 2.5, 2.8, 3.4, 4.1, 5.1, 5.2, 5.3, 6.5
<b>3. Demonstrate literacy as appropriate within a given discipline**</b>	3.3(e), 3.4(a, e), 3.6(a, e), 4.2(e)
<b>4. Apply problem solving skills or methods to make informed decisions in a variety of contexts**</b>	2.0, 3.3, 3.4, 4.2
<b>Course must include at least <u>one</u> of the following:</b>	
<b>5. Differentiate between ethical and unethical behavior</b>	
<b>6. Demonstrate an understanding of the physical, biological, and social environments and how individual behaviors impact this complex system.</b>	3.3, 3.4
<b>7. Demonstrate an understanding of and appreciation for human diversities and commonalities.</b>	
<b>8. Speak and listen effectively.</b>	

*\*General Education Competencies and Skills endorsed by 2010-2011 General Education Task Force*

### \*\*Required Competencies

#### 1) Read with critical comprehension.

The student will be introduced to the basic texts, concepts, vocabulary, and methods necessary for developing an understanding of the discipline and meeting the required benchmarks as stated in the course outline.

#### 2) Write clearly and coherently.

The student will demonstrate an understanding and mastery of subject matter in a variety of ways, including writing. Writing activities may include both graded and ungraded essays, short answer quizzes, summaries, reactions, journals, and various other reports.

#### 3) Demonstrate and apply literacy across all the disciplines (indicate which ones apply).

- a) **Information literacy** means understanding how to locate needed information, using the appropriate technology for the task, managing and evaluating the extracted information and using it effectively and ethically.
- b) **Technology literacy** is the ability to responsibly and effectively use appropriate technology to access, manage, integrate, or create information, and/or use technology to accomplish a given task.
- c) **Workplace literacy** is having the appropriate knowledge and skills to communicate and work with others effectively and perform job duties, whether it is through the use of computers and/or other technology.
- d) **Cultural literacy** is recognizing, understanding, and appreciating the similarities and differences between one's own culture and the cultures of others through a study of the arts, customs, beliefs, values, and history that define a culture.
- e) **Quantitative literacy** is having the ability to formulate, solve and interpret mathematical/statistical operations and graphical/tabular representations to make informed decisions.
- f) **Scientific literacy** means understanding the methodology and application of the scientific process, the physical and biological worlds, and recognizing that scientific knowledge is continuously updated or revised as new information is discovered.

**g) Environmental literacy** is creating a context within which environmental issues can be viewed, imparting knowledge to enhance one's ability to analyze the issues, make the connections between humans' decisions and actions and the challenges facing the environment, and instilling the desire to sustain the environment through ethical practices in both one's professional and personal lives.

**4. Apply problem-solving skills or methods to make informed decisions in a variety of contexts.**

The student will use acquired skills or methods to recognize, analyze, adapt, and apply critical thinking to solve problems and make informed decisions.

**EVALUATION:**

In the box to the right of the Methods of Assessment, enter all specific learning outcome numbers (i.e. 1.1, 2.7, 4.0, 4.2 and 5.12) that apply.

1. Portfolio	
2. Short essays	
3. Research Papers	
4. Group projects	3.4
5. Discussions (In class and online)	1.1, 1.2, 1.4, 1.5, 2.1-2.4, 2.9, 3.1, 3.2
6. Multiple Choice tests	1.0, 2.1-2.4, 2.6, 2.7, 2.9, 3.1- 3.3, 3.5, 3.6, 4.0, 5.0, 6.0
7. Presentations	
8. Service Learning Projects	
9. Quizzes (pop, announced, etc.)	1.0, 2.5, 2.8, 3.4, 4.1, 5.0, 6.0
10. Take-home tests	
11. Summaries, critiques, and analyses	
12. Reaction papers	
13. Surveys	
14. Performance	
15. Short answer tests	2.5, 2.8, 3.4, 5.0, 6.4, 6.5
16. Classroom debates and colloquia	
17. Blogs, wikis, web pages	
18. Other (Free response test)	1.0, 2.5, 2.8, 3.4, 4.1, 5.0, 6.4, 6.5

Common Course Number: MAC 1140

## UNITS

### Unit 1      **Polynomial, Rational, and Other Algebraic Functions, their Properties and Graphs**

General Outcome:

- 1 . 0    The students shall be able to recognize and graph polynomial, rational, and other algebraic functions, as well as write functions that satisfy specific characteristics.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 1.1    Recognize and construct the graphs of polynomial functions.
- 1.2    Recognize and construct graphs of rational functions.
- 1.3    Define, graph, and write the equations of vertical, horizontal, and slant asymptotes.
- 1.4    Recognize and construct graphs of piecewise functions.
- 1.5    Categorize and graph basic algebraic functions, such as absolute value, quadratic, cubic, radical, and reciprocal functions.
- 1.6    Create appropriate functions, from among the above-mentioned types, that satisfy specific given conditions.

Common Course Number: MAC 1140

**Unit 2      Polynomial and Rational Equations and Inequalities**

General Outcome:

- 2.0      The students shall be able to identify the zeros of polynomial functions, determine solutions to polynomial and rational inequalities, and the partial fraction decomposition of rational expressions.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 2.1      Determine the number of zeros of a polynomial and the multiplicity of each zero.
- 2.2      Read and apply the remainder theorem and the factor theorem.
- 2.3      Read and apply Descartes' rule of signs.
- 2.4      Read and apply the rational root theorem.
- 2.5      Formulate and write the steps for the partial fraction decomposition of a rational expression.
- 2.6      Determine the solutions to polynomial inequalities.
- 2.7      Determine the solutions to rational inequalities.
- 2.8      Perform synthetic division in applications involving polynomials.
- 2.9      Read, illustrate and apply the Intermediate Value Theorem.

Common Course Number: MAC 1140

**Unit 3 Exponential and Logarithmic Functions, their Properties and Graphs**General Outcome:

- 3.0 The students shall be able to recognize, graph and solve exponential and logarithmic functions.

## Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 3.1 Read and apply the definitions and properties of exponents and logarithms.
- 3.2 Recognize and graph exponential and logarithmic functions.
- 3.3 Recognize and solve exponential and logarithmic equations with both exact and estimated (using a calculator) solutions with regard to population growth, compound interest, carbon-14 dating, etc..
- 3.4 Read and solve applications of exponential and logarithmic functions such as exponential growth, decay such as population growth, compound interest, carbon-14 dating, etc. and interpret results in context writing solutions in both exact and estimated (using a calculator) formats.
- 3.5 Illustrate the change of base formula.
- 3.6 Evaluate logarithms using a calculator.

Common Course Number: MAC 1140

**Unit 4      Conic Sections**General Outcome:

4.0      The students shall be able to graph conic sections.

Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

4.1      Recognize, write the equations of, and graph conic sections such as parabolas, hyperbolas, ellipses, and circles.

4.2      Read and solve applications of conic sections and interpret results (optional).

Common Course Number: MAC 1140

**Unit 5      Systems of Equations and Inequalities, Matrices and Determinants**General Outcome:

- 5.0      The students shall be able to perform matrix operations and apply the theory and techniques used in solving systems of equations and inequalities.

## Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 5.1      Recognize and solve different types of systems of equations using the method of substitution.
- 5.2      Recognize and solve systems of linear equations in two or more variables using the elimination method, or matrix reduction techniques, and Cramer's rule.
- 5.3      Formulate the sum, difference, and product of two matrices; and the inverse (if it exists) of a matrix.
- 5.4      Demonstrate how to multiply a matrix by a scalar.
- 5.5      Recognize and graph different types of systems of inequalities (optional).

Common Course Number: MAC 1140

**Unit 6      Mathematical Induction, Sequences and Series, and the Binomial Theorem**General Outcome:

- 6.0      The students shall be able to apply properties of sequences and series, and demonstrate the use of the binomial theorem.

## Specific Measurable Learning Outcomes:

Upon successful completion of this unit, the student shall be able to:

- 6.1      Perform operations on summations; determine sequences defined recursively; and determine the  $n$ th term of an arithmetic or geometric sequence.
- 6.2      Compare the differences between arithmetic and geometric sequences
- 6.3      Determine the sum of the first  $n$  terms of an arithmetic or geometric sequence and also the sum of an infinite geometric series.
- 6.4      Use the principle of mathematical induction to prove statements (optional).
- 6.5      Apply the binomial theorem to expand powers of binomials; and write the  $k^{\text{th}}$  term of an indicated binomial expansion.