



# BROWARD COMMUNITY COLLEGE COURSE OUTLINE

**LAST REVIEW: 2010-2011    NEXT REVIEW: 2015-2016    STATUS: A**

**COURSE TITLE: Pre-calculus Algebra & Trigonometry**

**COMMON COURSE NUMBER: MAC 1147**

**CREDIT HOURS: 5**

**CONTACT HOUR BREAKDOWN**

*(per 16 week term)*

**CLOCK HOURS:**

*(Voc. Course ONLY)*

Lecture: **80**

Lab: **0**

Clinic: **0**

Other: **0**

**PREREQUISITE(S): MAC 1105 with a grade of B or better or permission of the Department Chair**

**COREQUISITE(S): None**

**PRE/COREQUISITE(S):**

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

This course is designed to satisfy the dual requirements of MAC 1114 and MAC 1140, thus preparing the student for the study of calculus. In this course the student will study various function families (e.g. polynomial, exponential, logarithmic, and trigonometric) from both analytic and graphical viewpoints, and will use them to model real-life situations. The student will be exposed to additional topics that will deepen their mathematical understanding, including systems, augmented matrices, sequences & series, and parametric functions. A graphing calculator may be required. Recommendation of the Mathematics Department or at least a grade of "B" 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 Graphs**
- 2. Polynomial and Rational Equations**
- 3. Exponential and Logarithmic Functions, with Their Properties and Graphs**
- 4. Trigonometric Functions, with Their Properties and Graphs**
- 5. Inverse Trigonometric Functions and Graphs**
- 6. Trigonometric Identities and Equations**
- 7. Triangle Trigonometry**



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- 8. Conic Sections**
- 9. Polar -Defined Functions**
- 10. Vectors and Parametric Equations**
- 11. Sequences and Summations**



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\*\*\* 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, 3.1, 3.4, 7.2, 7.3, 10.5
<b>2. Write clearly and coherently**</b>	1.0, 2.5, 2.6, 3.4, 6.0, 7.2, 7.3, 8.1, 10.1, 11.4
<b>3. Demonstrate literacy as appropriate within a given discipline**</b>	3.3 (e), 3.4(a, e), 4.4(e), 4.5(e), 5.1 (e), 7.3 (f), 10.1(f), 10.5(f)
<b>4. Apply problem solving skills or methods to make informed decisions in a variety of contexts**</b>	2.0, 3.3, 3.4, 4.3, 5.2, 7.2, 10.5
<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, 4.1, 7.3, 10.1, 10.5
<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.



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- 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.



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## 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, 2.1-2.4, 3.1-3.3, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0, 11.0
6. Multiple Choice tests	1.0, 2.1-2.4, 3.1-3.3, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0, 11.0
7. Presentations	
8. Service Learning Projects	
9. Quizzes (pop, announced, etc.)	1.0, 2.5, 2.6, 3.4, 4.0, 5.0, 6.0, 7.0, 8.1, 9.0, 10.0, 11.0
10. Take-home tests	4.0, 5.0, 6.0, 7.0, 9.0, 10.0
11. Summaries, critiques, and analyses	
12. Reaction papers	
13. Surveys	
14. Performance	
15. Short answer tests	2.5, 2.6, 3.4, 11.4
16. Classroom debates and colloquia	
17. Blogs, wikis, web pages	
18. Other (Free response test)	1.0, 2.5, 2.6, 3.4, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0, 11.4



**Common Course Number: MAC 1147**

**Unit 1 Polynomial, Rational, and other Algebraic Functions, with 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 Create appropriate functions, from among the above-mentioned types, that satisfy specific given conditions.



**Unit 2 Polynomial and Rational Equations**

General Outcome:

- 2.0 The student shall be able to identify the zeros of polynomial functions, determine solutions to polynomial and rational equations, and formulate 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 Perform synthetic division in applications involving polynomials.
- 2.6 Formulate and write the steps for the partial fraction decomposition of a rational expression.



**Unit 3 Exponential and Logarithmic Functions, with Their Properties and Graphs**

General Outcome:

- 3.0 The student shall be able to recognize and graph exponential and logarithmic functions; solve exponential and logarithmic equations.

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.



**Unit 4      Trigonometric Functions, with Their Properties and Graphs**

General Outcome:

- 4.0      The student shall be able to define, apply, and graph the trigonometric functions.

Specific Measurable Learning Outcomes:

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

- 4.1      Solve problems involving degree and radian measure of angles as they relate to circular models in the physical world.
- 4.2      Define the sine, cosine, tangent, cotangent, secant, and cosecant functions of angles and of real numbers.
- 4.3      Know and apply the fundamental identities relating the functions.
- 4.4      Sketch the graphs of the six basic trigonometric functions and specify the intervals over which they increase or decrease.
- 4.5      Identify and use the domain, range, amplitude, period and phase shift to graph trigonometric functions.



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**Unit 5      Inverse Trigonometric Functions and Graphs**

General Outcome:

- 5.0      The student shall be able to define, apply, and graph the inverse trigonometric functions.

Specific Measurable Learning Outcomes:

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

- 5.1      Define and graph the inverse trigonometric functions.  
5.2      Apply the definitions, methods of evaluating, and techniques of graphing the inverse trigonometric functions.



**Unit 6      Trigonometric Identities and Equations**

General Outcome:

- 6.0      The student shall be able to verify trigonometric identities and solve trigonometric equations.

Specific Measurable Learning Outcomes:

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

- 6.1      Write the proof of trigonometric identities by using fundamental identities, addition-subtraction formulas, co-function formulas, half-angle formulas, double-angle formulas, half-angle identities and product-to-sum and sum-to-product formulas.
- 6.2      Algebraically solve trigonometric equations, both with and without an interval specified.



**Unit 7      Triangle Trigonometry**

General Outcome:

7.0      The student shall be able to solve right and oblique triangles.

Specific Measurable Learning Outcomes:

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

- 7.1      Solve a right triangle using the definitions of sine, cosine and tangent (along with cosecant, secant and cotangent).
- 7.2      Read and interpret a word problem and apply the Law of Sines and Law of Cosines.
- 7.3      Read and interpret real world problems such as navigational, angle of elevation/depression, temperature, air flow, biorhythms, and time.



**Unit 8      Conic Sections**

General Outcome:

8.0      The student shall be able to graph conic sections.

Specific Measurable Learning Outcomes:

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

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



**Unit 9      Polar -Defined Functions**

General Outcome:

- 9.0      The student shall be able to manipulate between polar and rectangular coordinates:

Specific Measurable Learning Outcomes:

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

- 9.1      Plot points in polar coordinates on a polar plane.  
9.2      Convert ordered pairs from rectangular to polar coordinates and vice-versa.  
9.3      Convert equations in rectangular form to polar form and vice-versa.  
9.4      Plot graphs of simple polar equations.



**Unit 10      Vectors and Parametric Equations**

General Outcome:

10.0    The students shall be able to manipulate 2-dimensional vectors; use vectors to solve applied problems; and work with parametric equations.

Specific Measurable Learning Outcomes:

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

- 10.1    Interpret the various forms of vectors both geometrically and analytically as used in physics.
- 10.2    Perform operations of addition, subtraction, and scalar multiplication of vectors both geometrically and analytically.
- 10.3    Calculate the dot product of vectors, the scalar projection of a vector onto another vector, and the cosine of the angle between vectors.
- 10.4    Express vectors in trigonometric form.
- 10.5    Read, interpret, and solve applied problems using vectors as used in physics.



**Unit 11 Sequences and Series, and the Binomial Theorem**

General Outcome:

- 11.0 The students shall be able to apply properties of sequences and series, and binomial theorem.

Specific Measurable Learning Outcomes:

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

- 11.1 Perform operations on summations; determine sequences defined recursively; and determine the  $n^{\text{th}}$  term of an arithmetic or geometric sequence.
- 11.2 Compare the differences between arithmetic and geometric sequences
- 11.3 Determine the sum of the first  $n$  terms of an arithmetic or geometric sequence and also the sum of an infinite geometric series.
- 11.4 Apply the binomial theorem to expand powers of binomials; and write the  $k^{\text{th}}$  term of an indicated binomial expansion.