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Course Outline for MATH 20
PRE-CALCULUS MATHEMATICS
Effective: Fall 2018

I. CATALOG DESCRIPTION:

MATH 20 — PRE-CALCULUS MATHEMATICS — 5.00 units

Rational and polynomial functions with emphasis on logical development and graphing. Solution of polynomial equations and inequalities, graphing conic sections, mathematical induction, binomial theorem; strengthening of skills in working with exponential, logarithmic, and trigonometric functions, equations, graphs, and applications.

5.00 Units Lecture

Prerequisite

MATH 39 - Trigonometry
with a minimum grade of C

Grading Methods:

Letter Grade

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. MATH39

IV. MEASURABLE OBJECTIVES:

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

- A. Find zeros of polynomials using the Rational Root Theorem and synthetic division;
- B. Graph algebraic functions and relations;
- C. Prepare detailed graphs of conic sections;
- D. Create mathematical models using algebraic or transcendental functions;
- E. Graph using translations, reflections and distortions;
- F. Identify and use the trigonometric functions in problem solving;
- G. Simplify trigonometric expressions and prove trigonometric identities;
- H. Develop and use exponential, logarithmic and trigonometric formulas;
 - I. Graph exponential, logarithmic and trigonometric functions and their inverses;
 - J. Graph polar equations;
- K. Recognize the relationship between functions and their inverses graphically and algebraically
- L. Solve and apply equations including rational, linear, polynomial, exponential, absolute value, radical, and logarithmic, and solve linear, nonlinear, and absolute value inequalities
- M. Solve trigonometric equations, triangles, and applications
- N. Graph the basic trigonometric functions and apply changes in period, phase and amplitude to generate new graphs
- O. Solve systems of equations and inequalities
- P. Identify special triangles and their related angle and side measures

V. CONTENT:

- A. Functions and relations
 - 1. Definitions, evaluation, domain and range
 - a. Linear, polynomial, radical, exponential, absolute value, logarithmic, and trigonometric functions
 - 2. Graphs and trapping techniques including asymptotic behavior, intercepts, and vertices
 - 3. Transformations
 - a. Quadratic, absolute value, radical, rational, logarithmic, exponential functions
 - 4. Algebraic functions and relations
 - a. Linear, radical, absolute Value
 - 5. Algebra of functions and inverse functions

- 6. Modeling and applications
- B. Inequalities
 - 1. Review linear
 - 2. Absolute value
 - 3. Non-linear
- C. Systems of equations and inequalities
- D. Analytic geometry
 - 1. Conic sections
 - 2. Translations
- E. Roots of polynomial equations
 - 1. Division of polynomials, including synthetic division
 - 2. Factor and Remainder theorem
 - 3. Rational roots theorem
 - 4. Fundamental Theorem of Algebra
 - 5. Characterization of real and complex zeros
- F. Exponents and logarithms
 - 1. Exponential and logarithmic functions and graphs
 - 2. Properties of exponents and logarithms
 - 3. Solving equations
 - 4. Modeling and applications
- G. Trigonometry
 - 1. Trigonometric functions and graphs
 - a. Period, amplitude, phase shift
 - b. Inverse trigonometric functions
 - 2. Unit circle and right triangle trigonometry
 - 3. Trigonometric formulas and identities
 - 4. Solving equations
 - 5. Modeling and applications
- H. Polar coordinates and graphs of polar equations

VI. METHODS OF INSTRUCTION:

- A. **Lecture** -
- B. Assigned readings in the text
- C. **Lab** - assignments
- D. Group and individual activities in class
- E. 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 work a series of application problems involving triangle trigonometry using the Pythagorean Theorem, the Law of Sines and the Law of Cosines.
- 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: Solve a series of exponential and logarithmic equations.

VIII. EVALUATION:

- A. **Methods**
 - 1. Exams/Tests
 - 2. Quizzes
 - 3. Projects
 - 4. Group Projects
 - 5. Home Work
 - 6. Lab Activities
- B. **Frequency**
 - 1. Exams/Tests
 - a. Minimum of four exams plus the final exam
 - 2. Quizzes
 - a. Number of quizzes at the discretion of the instructor.
 - 3. Projects/Group Projects
 - a. Optional at the discretion of the instructor
 - 4. Homework
 - a. Daily and for each section covered
 - 5. Lab Activities
 - a. Minimum of eight laboratory assignments

IX. TYPICAL TEXTS:

- 1. Lial, Margaret, and John Hornsby and David Schneider *Precalculus*. 10th ed., Pearson, 2016.
- 2. Stewart, James and Lothar Redlin, and Saleem Watson *Precalculus-Mathematics for Calculus*. 7th ed., Brooks Cole, 2015.
- 3. Blitzer, Robert *Precalculus*. 5th ed., Pearson Education, 2014.

X. OTHER MATERIALS REQUIRED OF STUDENTS:

- A. Graphing calculator

