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**Course Outline for MATH 20**  
**PRE-CALCULUS MATHEMATICS**  
**Effective: Fall 2015**

**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 38 - Trigonometry with Geometry  
with a minimum grade of C

**Grading Methods:**

Letter Grade

**Discipline:**

	<b>MIN</b>
<b>Lecture Hours:</b>	90.00
<b>No Unit Value Lab</b>	18.00
<b>Total Hours:</b>	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. MATH38

**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. Solve equations involving logarithmic, exponential and trigonometric functions;
- D. Prepare detailed graphs of conic sections;
- E. Create mathematical models using algebraic or transcendental functions;
- F. Use sign graphs to solve non-linear inequalities;
- G. Perform operations on arithmetic and geometric sequences;
- H. Construct a proof using mathematical induction;
- I. Graph using translations, reflections and distortions;
- J. Identify and use the trigonometric functions in problem solving;
- K. Simplify trigonometric expressions and prove trigonometric identities;
- L. Develop and use exponential, logarithmic and trigonometric formulas;
- M. Graph exponential, logarithmic and trigonometric functions and their inverses;
- N. Graph polar equations;
- O. Perform partial fraction decomposition;
- P. Perform basics calculations on vectors and use them in problem solving.

**V. CONTENT:**

- A. Functions, relations and their graphs
  - 1. Algebraic functions and relations
  - 2. Polynomial functions
  - 3. Rational functions
  - 4. Graphing techniques
  - 5. Algebra of functions and inverse functions
  - 6. Modeling and applications
- B. Inequalities
  - 1. Review linear
  - 2. Absolute value

- 3. Non-linear
- C. Mathematical induction: binomial theorem
  - 1. Summations algebra
  - 2. Sequences and series
- D. Analytic geometry
  - 1. Conic sections
  - 2. Translation and rotation of the plane
- E. Roots of polynomial equations
  - 1. Division of polynomials, including synthetic division
  - 2. Factor and Remainder theorem
  - 3. Rational roots theorem
- 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
  - 2. Inverse trigonometric functions and their graphs
  - 3. Trigonometric formulas and identities
  - 4. Solving equations
  - 5. Modeling and applications
- H. Polar coordinates and graphs of polar equations
- I. Partial fraction decomposition
- J. Vectors
  - 1. Basic computations
  - 2. Solving static equilibrium problems and true velocity problems

#### 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
- 7. Other:
  - a. Methods
    - 1. Examinations
    - 2. Final Exam
    - 3. Any or all of the following at the discretion of the instructor
      - a. Homework
      - b. Quizzes (announced or unannounced, in-class or take-home)
      - c. Collaborative group activities
      - d. Labs
      - e. Projects

##### B. **Frequency**

- 1. Frequency
  - a. Recommend minimum of four exams plus the final
  - b. Homework should be assigned for each section covered
  - c. Recommend minimum of eight laboratory assignments over the semester
  - d. Number of quizzes and collaborative activities are at the discretion of the instructor.

#### IX. TYPICAL TEXTS:

- 1. Stewart, James, Lothar Redlin, and Saleem Watson. *Precalculus-Mathematics for Calculus*. 6th ed., Brooks Cole, 2012.
- 2. Lial, Margaret, John Hornsby, David Schneider, and Callie Daniels. *Precalculus*. 5th ed., Pearson Education, 2013.
- 3. Blitzer, Robert. *Precalculus*. 5th ed., Pearson Education, 2014.

- X. OTHER MATERIALS REQUIRED OF STUDENTS:
- A. Graphing calculator