

Syllabus: MA 106 – Pre-Calculus Trigonometry¹

Course Description. (3 semester hours) Trigonometric functions (circular functions) and their inverses, graphs, and properties; right triangle trigonometry and applications; analytic trigonometry, trigonometric identities and equations; polar coordinates, vectors, complex numbers, DeMoivre's theorem; laws of sines and cosines; conic sections.

(As an integral part of the course, MAPLE, a computer algebra system, will be used for several projects.)

Materials: Required Textbook: *Precalculus, Understanding Functions, A graphical Approach*, Brooks/Cole, 2000. A Student Solutions Manual is available. Each instructor will employ three out of five department generated laboratory projects, or will substitute comparable ones.

Prerequisite. Grade of "C" or better in MA 105 or satisfactory score on mathematics Calculus Screening Test Part I.

Objectives. Students will develop an understanding of circular functions and analytic trigonometry as a foundation for calculus. They will be able to graph trigonometric functions and their inverse functions and discuss the domain, range, and properties of these functions. Students will understand the plane from the point of view of rectangular coordinates, polar coordinates, vectors, and complex number, and know how to move among these representations. They will be able to apply trigonometric principles to solve problems using triangles; develop an understanding of conic sections, their definitions, and their graphs; and be able to use elimination and substitution to solve simple linear systems of equations.

Assessment Procedures. Student achievement will be assessed by any or all of several measures: graded daily or weekly homework exercises, short weekly quizzes, several projects or mathematical lab experiments, and two or three major tests per term in addition to a final examination. A numerical grade is given on each item.

Grading Policy. Student achievement on the items assessed will be used to determine the final grade. The percentage of the final numerical grade (0-100 scale) each item counts may vary by course section at the instructor's discretion within the following parameters: final exam (at least 35%), three to five tests (30%-50%); graded homework and/or quizzes (10%-15%); MAPLE labs and projects (5%-15%). Final letter grades are assigned traditionally: A (90-100), B (80-90), C (70-79), D (60-69), F (below 60), subject to the instructor's judgment.

Course Outline—Topics

1. Conic sections: circles, parabolas, ellipses, hyperbolas
2. Radian and degree measure; circular functions
3. Right triangle trigonometry; trig functions of any angle
4. Applications of trigonometry
5. Graphs of trig functions
6. Inverse trig functions
7. Fundamental trig identities, verifying trig identities
8. Solving trig equations
9. Sum and difference formulas; multiple angle and product formulas
10. Law of sines, law of cosines
11. Vectors in the plane
12. Complex numbers, trigonometric form of complex numbers
13. Polar coordinates

¹Written by Jeanne Hutchison/Approved by Precalculus Committee 5/30/01, updated JCM 8/19/04

MA 106 Suggested Semester Schedule

Week	Sections	Topics (Include at least three MAPLE labs)
1	6.1, 6.2	Angle measurement, two special triangles, trig functions of a general angle
2	6.3, 6.4	Right triangle trigonometry, applications, trig functions of real numbers
3	7.1, ML1	Graphs of $y = A \sin(Bx)$ and $y = A \cos(Bx)$, introduction to MAPLE
4	Test 1, 7.2, ML 2	Graphs of sine and cosine: shifts; other trig functions and their graphs, graphs in MAPLE
5	7.3, 7.4	Basic identities, trigonometric equations
6	7.5, 8.1	Inverse trigonometric functions, additional formulas
7	Test 2, 8.2	Double-angle and half-angle formulas
8	8.3, ML 5	Law of Sines, Law of Cosines, MAPLE derivation of identities
9	8.4, 1.5	Vectors, complex numbers
10	Test 3, 8.5	Trigonometric form of complex numbers, DeMoivre's Theorem
11	8.6, ML 4	Polar coordinates; polar graphs in MAPLE—finding intersection points
12	10.1, 10.2	Conic Sections: circles and parabolas
13	Test 4, 10.3	Ellipses
14	10.4, 10.5	Hyperbolas, identifying conic sections, degenerate forms
15	ML 3, Test 5	Conic graphs in MAPLE
FINAL	EXAM	Part I (40%): Calc. Screening Test, Part 2; Part II (60%): Assorted Problems

MA 106 Homework Assignments

Plenty of homework problems are to be assigned. At least half of them should be even-numbered since the Student Solutions Manual has all the odd-numbered ones worked out. One possibility is to assign roughly every other odd problem (1,5,9,...) and every other even (4,8, 12...) in each section. Selected problems must be graded, or regular quizzes given, to ensure students are keeping up with the work.

MA 106 Suggested Summer Schedule

Week	Sections	Topics (Include at least three MAPLE labs.)
1	6.1-6.3	Angles, special triangles, trig. functions of a general angle, right triangle trigonometry and applications
2	6.4, 7.1-7.2 ML 1 & 2	Graphs of sine, cosine, and other trig functions. Introduction to Maple, and graphs in MAPLE. (The first two MAPLE labs might be combined.)
3	7.3, 7.4, Test 1	Basic identities, trigonometric equations; Test 1 (6.1-7.3)
4	7.5, 8.1, 8.2	Inverse trigonometric functions, addition, double- and half-angle formulas
5	8.3, ML 5, 8.4	Laws of Sines and Cosines; MAPLE derivation of identities; vectors
6	1.5, 8.5, Test 2	Complex numbers, trig form of complex numbers; Test 2 (7.4-8.4)
7	8.6 10.1, 10.2	Polar coordinates; conic sections: circle and parabola
8	ML3 or 4, 10.3-4	Polar graphs in MAPLE—finding intersection points OR Conic graphs in MAPLE. Conic sections: ellipse, hyperbola
9	10.5, Test 3	Identifying conic sections; Test 3 (1.5, 8.5-10.4)
	FINAL EXAM	Part I (40%): Calc. Screening Test, Part 2 Part II (60%): Assorted Problems

Developed Maple Laboratory Projects

ML 106-1& 2	Graphs of Trigonometric Functions I and II
ML 106-3	Graphs of Conic Sections
ML 106-4	Intersection points of Polar Graphs
ML 106-5	Derivation of Identities

Associated Section(s)

Sections 7.1 & 7.2
Chapter 10
Section 8.6
Sections 8.1 & 8.2