Welcome to College Trigonometry! M122 is a one-semester three-credit course; its main focus is the study of trigonometry and, together with M121 (College Algebra), to prepare you for Calculus. Placement in M122 is based on your successful completion of M121 (College Algebra) with a grade of C- or better (B- or better is recommended). (I also assume your successful completion of M121 was recent.) College Algebra (M121) and College Trigonometry (M122) together satisfy the same degree requirements as Precalculus (M151). Credit is not allowed for both M122 and M151.

Be certain that you are enrolled in the proper math class at the beginning of the semester. You may not be able to switch into a more appropriate class after the first week. If you have any concerns about your placement please contact me immediately.

What is trigonometry, and why do we study it? Trigonometry is the branch of mathematics dealing with the measurements and relationships of various types of triangles and their sides and angles. Although you might not expect this discipline would turn up in so many areas—physical applications of the world around us, as well as in many branches of physics and higher mathematics—this is indeed the case. Applications of trigonometry are found wherever angles and/or curves are involved.

Part of trigonometry—an important part—is practical, but I think it is simplistic to consider this part its only value. Like any branch of academic study, trigonometry furnishes us with mental frameworks that make our world more understandable, every day. In fact, the larger and more important goal in this course is not to solve a triangle, but to continue to learn abstract reasoning.

This course has been designed for you. Yes, you! Your willing participation is essential if you plan to succeed in this course. No one can teach you if you are not engaged and ready to learn. You need to do your part by preparing on your own to the best of your ability. Put in some effort. Don’t fall behind. Challenge yourself. Ask questions! If you keep up with the homework, you will find the material makes sense and the obstacles are manageable.

I cannot emphasize enough how important it is for you to be diligent in your study habits. You cannot learn math by wishful thinking alone; I am convinced of this. Different students have different learning styles, but every student can improve with effort. Find the technique that works best for you.

We can’t solve problems by using the same kind of thinking we used when we created them. ~Albert Einstein
LEARNING GOALS: Upon successful completion of this course, students will be able to
1. Define trigonometric ratios using right triangles and coordinate systems.
2. Understand and use the unit circle and polar coordinates.
3. Graph trigonometric functions of a real variable.
4. Investigate the algebra of trigonometric functions, including composition of functions, inverse functions, and transformations.
5. Use trigonometric laws and identities to solve equations.
6. Use trigonometric functions of a real variable to model real-world phenomena and solve applied problems.
7. Understand and use basic polar coordinates.
8. Understand and use basic vector operations.
9. Understand and use basic parametric equations.

ATTENDANCE: Attendance is not an official part of your final grade in M122, but no one can teach you if you are not in class engaged and ready to learn. Turn off your cell phone (and yes, that includes texting). Come to class and come prepared. Do your homework regularly. Don’t fall behind. You cannot expect to succeed in this course if you miss many classes; important information may be shared at any time that may not be posted on MyLabsPlus.

It is impossible to stress strongly enough how important it is for you to be diligent in your study habits. Pay attention and cultivate a positive attitude! No matter how you feel about studying math, personal responsibility and a solid work ethic are great attributes to be able to claim as your own. You are an important part of this class — you can make it lively and interesting or silent and boring. Develop a positive working relationship with your classmates and instructor. If you keep up with the work, the subject makes sense and the challenges are manageable. If you feel threatened by math, practice some of the techniques used to reduce math anxiety; there are links at the end of the syllabus.

University of Montana policy states:

Students who are registered for a course but do not attend the first two class meetings may be required by the instructor to drop the course. This rule allows for early identification of class vacancies to permit other students to add classes. **Students not allowed to remain must complete a drop form or drop the course on the internet** (**http://cyberbear.umt.edu**) to avoid receiving a failing grade. Students who know they will be absent should contact the instructor in advance.

Students are expected to attend all class meetings and complete all assignments for courses in which they are enrolled. Instructors may excuse brief and occasional absences for reasons of illness, injury, family emergency, or participation in a University sponsored activity. (University sponsored activities include for example, field trips, ASUM service, music or drama performances, and intercollegiate athletics.) Instructors shall excuse absences for reasons of military service or mandatory public service.

**MYLABSPLUS (MLP):** MyLabsPlus is an innovative way for you to do homework and take quizzes with immediate feedback; MyLabsPlus also keeps you on task and using your developing math skills. Every section of the M122 text covered in class has a corresponding assignment in MyLabsPlus; each homework question can be reattempted up to four times until the unit closes. Review exercises at the end are optional but recommended.

There is a chapter quiz for each of the chapters covered in class as well; each quiz can be taken twice and the higher score is the recorded score. **NOTE** that these assignments and chapters are open for specific times and in a specific order. Check the MyLabsPlus calendar frequently and attend class to be sure you are keeping current with your assignments. You must keep up with the progression in order to succeed in this course. The direct link to MyLabsPlus is umt.edu/mylabsplus or access the site through login.umt.edu.

**CALCULATOR:** A graphing calculator is required for M122; the Department of Applied Arts and Sciences recommends and uses Texas Instruments models TI-83 or TI-84 (regular or plus editions). Calculators with symbolic manipulation capabilities (e.g. TI-89, TI-92) will not be allowed in testing situations.
TUTORING: Math tutoring is available for all UM students. Check for hours at the ASC on the Missoula College East Campus (AD 06) and at math@Mansfield on the Mountain Campus: http://www.umt.edu/math/MLC/default.htm.

STUDENTS WITH DISABILITIES: The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students (DSS). If you think you may have a disability adversely affecting your academic performance, and you have not already registered with DSS, please contact DSS in EL154 (mountain campus), telephone number 243-2243. Their website is http://life.umt.edu/dss/. I will work with you and DSS to provide an appropriate accommodation.

IN-CLASS TESTS: Five tests will be given in class. They give you an opportunity to demonstrate what you have learned, and are not intended to intimidate you. Graphing calculators removed from their cases are permitted, but may not be shared with other students during the test. All scratch work must be done directly on the test and returned to me when leaving the classroom. The lowest test score will be dropped.

A single page (8½”x11”) of notes (both sides) may be used to assist you during tests.

When circumstances prevent you from taking a test at the scheduled time, contact me PRIOR to the time of the test to report your absence. Absences are excused only for reasons of illness, injury, family emergency, or a University-sponsored activity. Arrangements for a make-up test must occur within a week of the scheduled exam date. Failure to arrange a make-up test within a week of the scheduled exam date will result in a score of zero for the test. Corrected tests will be returned within one week after the test date. If you have questions regarding the grading of your test, please wait until after class to discuss it.

FINAL EXAM: The final exam for this class is comprehensive and is worth 150 points. The exam will be given in class. You may have a page (8½” x 11”) of notes (both sides) to assist you. If you think that you have math anxiety, I suggest that you prepare carefully; there are also links on p. 4 addressing math anxiety that may help you. The University of Montana also offers workshops that you may choose to attend.

DROPPING AND ADDING COURSES OR CHANGING SECTIONS, GRADING OR CREDIT STATUS: Students are expected, when selecting and registering for their courses, to make informed choices and to regard those choices as semester long commitments and obligations.

After registering and through the first fifteen (15) instructional days of the semester, students may use Cyberbear (http://cyberbear.umt.edu) to drop and add courses or change sections and credits.

Change of grading option to audit is not allowed after the 15 instructional day.

Beginning the sixteenth (16) instructional day of the semester through the forty-fifth (45) instructional day, students use paper forms to drop, add and make changes of section, grading option, or credit. The drop/add form must be signed by the instructor of the course and the student’s advisor. The signed drop/add form must be returned to the Registration Counter (or the Registrar’s Office at The Missoula College) no later than the forty-fifth instructional day.

Beginning the forty-sixth (46) instructional day of the semester through the last day of instruction before scheduled final examinations, students must petition to drop. The petition form must be signed by the instructor of the course and the student’s advisor and, the dean of the student’s major. The instructor assigns a grade of WP (withdraw/passing) if the student’s course work has been passing or a WF (withdraw/failing) if the course work has been failing. These grades do not affect grade averages but they are recorded on students’ transcripts. Documented justification is required for dropping courses by petition. Some examples of documented circumstances that may merit approval are:

- Error in registration,
- Accident or illness,
- Family emergency, or
- Other circumstances beyond the student’s control

Reasons that are not satisfactory include:

- Forgetting to turn in a drop slip
- Protecting a student’s grade point average

The opportunity to drop a course for the current term ends on the last day of instruction before scheduled final exams. Dropping a course taken in a previous term or altering grading option or audit status for such a course is not allowed. The only exceptions are for students who have received a grade of NF (never attended).
WITHDRAWAL FROM THE UNIVERSITY: Students who withdraw from the University while a semester is in progress must complete withdrawal forms which are obtained from the Registration Counter in Griz Central in the Lommasson Center or the Registrar’s Office in The Missoula College. Drop/add forms cannot be used to withdraw from school and students are not allowed to drop all their courses on the internet. Medical withdrawals are granted only for a student’s significant health problems and must be documented by a healthcare provider.

When withdrawal forms are completed in Griz Central or the Registrar’s Office in The Missoula College before the last two weeks of the semester, grades of W (withdrawal) are assigned. Beginning two weeks from the end of the term, students may not withdraw from the University except for very unusual circumstances.

INCOMPLETES: A grade of incomplete (I) will only be considered when all three of the following are true:
1. The student has been in regular attendance and passing up to three weeks before the end of the academic semester.
2. Factors beyond the student’s control make it impossible to complete the course on time.
3. The instructor and the student agree that there is a reasonable probability that the student will be able to make-up the work required to complete the course and specific arrangements are drawn up and signed by both.

A student who receives an incomplete has one calendar year to resolve the incomplete (I) before it automatically reverts to a failing grade (F).

GRADING POLICIES: M122 must be completed with a grade of C or better in order to contribute towards satisfying the UM Math Literacy requirement. Auditing M122 or taking it as a Credit/No Credit course will not fulfill the requirement.

The final grade will be computed as follows:
- MyLabsPlus homework: 150 points (30 @ 5 points each)
- MyLabsPlus quizzes: 200 points (4 @ 50 points each — lowest score dropped)
- In-class tests: 400 points (4 @ 100 points each — lowest score dropped)
- Final exam: 150 points
- TOTAL: 900 points

Letter grades correspond to numerical scores according to this plan:

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<th>Grade</th>
<th>Percentage</th>
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<tr>
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<td>B</td>
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<td>C</td>
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<td>D</td>
<td>60-69%</td>
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<td>F</td>
<td>Below 60%</td>
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ACADEMIC CONDUCT: All students must practice academic honesty as defined by the Student Conduct Code, available at http://life.umt.edu/vpsa/documents/StudentConductCode1.pdf. Academic misconduct is subject to an academic penalty by the instructor and a disciplinary sanction by the University.

OTHER INFO:
Academic Support Center (Missoula College): AD06, phone # 243-7826 (need 2 days’ notice for make-up tests)
Math Learning Center (Math Bldg, Main Campus): Basement — used for taking make-up tests
math@Mansfield: Mansfield Library — drop-in tutoring center http://www.umt.edu/math/MLC/default.htm
Academic calendar available at http://www.umt.edu/provost/academiccalendar.html
Finals schedule available at http://umt.edu/registrar/students/finalsweek2/Autumn.aspx
OneStop (look for MyLabsPlus link): http://onestop.umt.edu/
Some useful websites: http://www.khanacademy.org/
http://www.intmath.com/
http://www.purplemath.com/
http://algebasics.com/
http://www.prenhall.com/divisions/esm/app/graphing/ti83/ great TI calc tutorial
http://www.prenhall.com/divisions/esm/app/calc_v2/ graphing calc help
http://incompetech.com/graphpaper/ free graph paper generator
http://www.mathacademy.com/pr/minitext/anxiety/ Coping with Math Anxiety
http://mtsu32.mtsu.edu:11064/anxiety.html Help for Math Anxiety
## M122 Autumn 2012 Course Outline:

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<th>Jan 28</th>
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**Feb 18 Presidents’ Day Holiday**

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**Final**

The final exam for this class is scheduled for 10:10 to 12:10, Wednesday, May 15th, in this classroom.

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Important Dates and Deadlines is found at [http://www.umt.edu/registrar/forms/pdf/ImportantDates2012FINAL.pdf](http://www.umt.edu/registrar/forms/pdf/ImportantDates2012FINAL.pdf)

See the MyLabsPlus calendar to find the opening and closing dates for MyLabsPlus assignments.
Table of Contents

Chapter R Review
R.1 Real Numbers (sets, properties of real numbers)
R.2 Algebra Essentials (laws of exponents)
R.3 Geometry Essentials
R.4 Polynomials (multiply binomials – FOIL)
R.5 Factoring Polynomials
R.6 Synthetic Division
R.7 Rational Expressions (omit objective 5)
R.8 nth Roots; Rational Exponents (objectives 2 and 3)

Chapter 1 Equations and Inequalities
1.1 Rectangular Coordinates; Graphing Utilities; Introduction to Graphing Equations
1.2 Solving Equations Using a Graphing Utility; Linear and Rational Equations
1.3 Quadratic Equations
1.4 Complex Numbers; Quadratic Equations in the Complex Number System
1.5 Radical Equations; Equations Quadratic in Form; Absolute Value Equations; Factorable Equations
1.6 Problem Solving: Interest, Mixture, Uniform Motion, Constant Rate Jobs
1.7 Solving Inequalities

Chapter 2 Graphs
2.1 Symmetry; Graphing Key Equations
2.2 Lines
2.3 Circles
2.4 Variation

Chapter 3 Functions and Their Graphs
3.1 Functions
3.2 The Graph of a Function
3.3 Properties of Functions
3.4 Library of Functions; Piecewise-defined Functions
3.5 Graphing Techniques: Transformations
3.6 Mathematical Models: Building Functions

Chapter 6 Exponential and Logarithmic Functions
6.1 Composite Functions
6.2 One-to-One Functions; Inverse Functions
6.3 Exponential Functions
6.4 Logarithmic Functions
6.5 Properties of Logarithms
6.6 Logarithmic and Exponential Equations
6.7 Financial Models
6.8 Exponential Growth and Decay Models; Newton's Law; Logistic Growth and Decay Models
6.9 Building Exponential, Logarithmic, and Logistic Models from Data

Chapter 7 Trigonometric Functions
7.1 Angles and Their Measure
7.2 Right Triangle Trigonometry
7.3 Evaluating Trigonometric Functions of Acute Angles
7.4 Evaluating Trigonometric Functions of General Angle
7.5 Unit Circle Approach; Properties of the Trigonometric Functions
7.6 Graphs of the Sine and Cosine Functions
7.7 Graphs of the Tangent, Cotangent, Cosecant, and Secant Functions
7.8 Phase Shift; Building Sinusoidal Models

Chapter 8 Analytic Trigonometry
8.1 The Inverse Sine, Cosine, and Tangent Functions
8.2 The Inverse Trigonometric Functions (Continued)
8.3 Trigonometric Identities
8.4 Sum and Difference Formulas
8.5 Double-angle and Half-angle Formulas
8.6 Product-to-Sum and Sum-to-Product Formulas
8.7 Trigonometric Equations (I)
8.8 Trigonometric Equations (II)

Chapter 9 Applications of Trigonometric Functions
9.1 Applications Involving Right Triangles
9.2 The Law of Sines
9.3 The Law of Cosines
9.4 Area of a Triangle
9.5 Simple Harmonic Motion; Damped Motion; Combining Waves

Chapter 10 Polar Coordinates; Vectors
10.1 Polar Coordinates
10.2 Polar Equations and Graphs
10.3 The Complex Plane; De Moivre's Theorem
10.4 Vectors
10.5 The Dot Product

Chapter 11 Analytic Geometry
11.1 Conics
11.2 The Parabola
11.3 The Ellipse
11.4 The Hyperbola
11.5 Rotation of Axes; General Form of a Conic
11.6 Polar Equations of Conics
11.7 Plane Curves and Parametric Equations

Plain text: assumed prerequisites
Italics: M122 course content