

MATH 112 – Trig and Functions COURSE SYLLABUS · SPRING 2019

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|----------------------|---|----------------------|---------------------------------------|
| INSTRUCTOR: | Roger Griffiths | OFFICE HOURS: | |
| OFFICE: | Old Main 305 | | Mon: 09:00 - 09:50 |
| EMAIL: | rgriffiths@mercyhurst.edu | | Mon: 3:00 - 3:50 |
| PHONE: | 824-2123 | | Tues: 08:50 - 09:20 (in Hirt M209) |
| CLASS TIME: | Mon, Wed, Fri: 12:00 - 12:50, (3 semester credits) | | Thur: 08:00 - 09:20 (in Hirt M209) |
| LOCATION: | Hirt M209 | | |
| PREREQUISITE: | College Algebra (M111) or ALEKS Score 61 or higher | | |
| WEB: | http://math.mercyhurst.edu/~griff/courses/m112/ | | Thur: 2:00 - 2:50 |
| TEXT: | <i>Precalculus</i> , (6th Edition) by Robert Blitzer | | Fri: 10:00 - 10:50 |

PREREQUISITES

To remain enrolled in this course, you must satisfy at least one of the following criteria:

- Passed College Algebra (Math 111), or transfer credit for equivalent.
- Score of 61 or better on the ALEKS Mathematics Placement Assessment.

If none of these apply, you should make arrangements to take the ALEKS Math Placement Assessment before the Add/Drop deadline on Friday, January 18th. **Students that do not meet the prerequisites by this deadline may be dropped from the course.**

COURSE CONTENT

This is a course in trigonometry and precalculus, similar to high school courses in algebra II/trigonometry and precalculus, except that the pace will be faster. We will begin with a review of the function concept and some specific families of functions, and proceed into graphs, zeros, and other aspects of functions. The latter portion of the course will focus on trigonometric functions, including graphs, identities, formulas, and laws that involve these functions.

LEARNING OBJECTIVES

By the end of this course, you will have acquired many mathematical tools which include the ability to:

- Perform algebraic operations and find solutions to equations and simplify algebraic expressions; that is reinforce your foundation in algebra and trigonometry.
- Use common algebraic methods to solve linear, quadratic, polynomial, radical, and absolute value equations and inequalities.
- Use and create algebraic functions as well as determine the domain of elementary functions.
- Recognize trigonometric functions and know how to use them.
- Use analytical trigonometry to derive trigonometric identities from basic identities, and solve trigonometric equations.
- Translate written problems to create trigonometric models to solve real-life problems.
- Demonstrate your understanding of introductory language of mathematics through the use of proper mathematics notation.
- Develop your problem-solving skills, while fostering critical thinking.

TEXTBOOK

Precalculus, 6th Edition, by Robert Blitzer. You will need this textbook, and be sure to check the edition when purchasing your textbook; other editions have similar material, but the assigned problems may be different. No other materials are required for this class. You do NOT need to purchase a subscription to MyMathLab or pay to access any other online resources. If you prefer to purchase an electronic version of the text or the binder version, you're welcome to do so.

CALCULATORS

Calculators are not required or even recommended for this course, and **you will not be permitted to use a calculator or computer on any quiz or exam.**

You are strongly encouraged to avoid using a calculator while working on homework. *All of our examinations are carefully designed to be taken "closed book" without the use of calculators, computers or "crib sheets"*. Examination problems will focus on the basic formulas and problem solving techniques which every college graduate should know without a calculator or textbook. We will be interested in learning the process and writing mathematics, not necessarily in answers.

HOMEWORK

I do not collect or grade your written homework. You will be held accountable for the mastery of homework problems via the quizzes (which can occur any day). As such, you get no credit for *merely attempting the homework*, your goal is to master each type of problem assigned.

HOMEWORK SUGGESTIONS

- The textbook exercises typically begin with several groups of problems that cover small pieces of the material covered in that section. The exercises near the end of that section often put those ideas all together, necessitating mastery of the low-numbered exercises before attempting the latter. However, working only the low-numbered exercises will not prepare a student sufficiently for the quizzes or exams.
- Most of science and mathematics (and, I believe most endeavors) is learning how to recover from little failures (our mistakes, incorrect assumptions, crashes, etc), until at last we succeed. Any endeavor worth doing takes much practice to become proficient. Think about snowboarding, the violin, chess, ice hockey, and so on; you can practice for years and continue to get better, learn new tricks, reach the next level of proficiency. People work that hard for the love of their sport, hobby, or profession. Mathematics as an art is no different. Although, most of you will probably always view mathematics as a tool or possibly the language of science. But most of the modern world is built on the back of that science and engineering, which is built on mathematics. It is for that reason that you should be willing to expend the necessary effort, work through your frustrations and failures, and, in the end, achieve success in this, and subsequent mathematics courses.
- **Homework is far and away the single most important part of any mathematics course** because this is when most (all) of the learning takes place. Homework problems will be assigned regularly and I expect you to do them. If you are unable to do a problem I expect you to find out how to do it. You have at your disposal several means of meeting this expectation.
 - You can stick with it until you figure it out yourself.
 - You can discuss the problem with a classmate or several classmates (strongly encouraged).
 - You can work through the problem with one of the mathematics tutors available for this course; see: <http://math.mercyhurst.edu/Tutoring/> for more information.
 - You can ask me about the problem in class (time permitting).
 - You can see me individually during my office hours. I am always happy to talk to you during my office hours or at any other time if not otherwise committed; when coming to my office, be prepared to show me what you've already tried.

- You can discuss the problem with anyone who can and is willing to help you.
- In studying mathematics, you must be careful not to let a tutor or friend *think* for you. It is essential that you can work problems **completely on your own, without help from any resource**, by the time of a quiz or exam.
- Simply ignoring a problem that you are unable to solve is not **acceptable**.
- You should continue to work problems of a given type (even beyond the assigned problems) until you see the pattern yourself, without assistance of any type (i.e. without using your notes, worked examples, or any prior problems).
- Attending every class is not enough; mathematics can only be learned through practice (like anything worth mastering).
- Remember, the general rule of thumb for a college level class is that one should put in at least 2 hours of work outside class for every hour in class. This means that you should be working on this course for about 6 hours a week outside of class.

EVALUATION

Your letter grade in this course will be based on:

- 100 points: **Quizzes** Quiz average out of 100 points, will drop 1 quiz score
- 400 points: **Exams:** 4 exams at 100 points each
- 200 points: **Final Exam** Comprehensive Final exam worth 200 points
- 700 points: **Total points** in the course

And assigned according to the following scale:

| Total Class Points | Percent % | Letter Grade | Interpretation |
|--------------------|-----------|--------------|----------------|
| 630 - 700 | 90 to 100 | A | Exceptional |
| 609 - 629 | 87 to 89 | B+ | Outstanding |
| 560 - 608 | 80 to 86 | B | Very Good |
| 539 - 559 | 77 to 79 | C+ | Good |
| 490 - 538 | 70 to 76 | C | Satisfactory |
| 420 - 489 | 60 to 69 | D | Unsatisfactory |
| 0 - 419 | Below 60 | F | Failure |

- ✓ Your overall performance in the course is measured by the total number of points you accumulate relative to the maximum 700 points possible. Your letter grade in this course will be based on the distribution above, the standard scale used in the Mathematics Department.
- ✓ These are the only points possible in this class, there is no extra credit (or 'make up'), your asking for extra credit is a clear indication that you have not read your contract (this syllabus).

COURSE POLICIES

- ✓ Every student is required to establish a *class contact*, that is, a fellow classmate that you may contact in case you are having a problem with a particular homework exercise at night/weekend or in the event you miss class, you can get the class notes from them.
- ✓ You are responsible for all that is announced or covered in class even if you are absent.

- ✓ You are responsible for all the material in a given section unless told otherwise, use the course schedule and suggested homework as a guide.
- ✓ A prerequisite for additional help outside the classroom is regular class attendance.
- ✓ If you miss class, you are responsible for getting the notes from your 'class contact' (see above).
- ✓ Email is great for **simple** communications, but more complex issues must be handled in person.
- ✓ Don't use email as an excuse to avoid personal contact.
- ✓ Due to the overwhelming amount of email I receive, any email requests that involve a complicated response may not get addressed in a timely fashion, please come see me in that case.
- ✓ I expect you to read this syllabus and get clarification of any items you do not understand during the first week of class. After that, if you send me an email asking me about something covered in this syllabus, that email will likely be disregarded.

QUIZZES

- You will be given quizzes regularly. Keeping up with the homework, as detailed above, will ensure that you are prepared for the quizzes.
- The quizzes will be based largely on the suggested homework, and should be expected any day (if you are paying attention in class, I generally suggest when the next quiz will occur).
- Everyone is allowed to miss one quiz without penalty (for any reason); thus, there are NO make up quizzes. If you end up taking all of the quizzes, you may drop your low quiz score. Athletes or other individuals missing for school activities are to let me know BEFORE missing the quiz (or it lands above).
- The quizzes serve as an immediate assessment of the extent to which you mastered a particular assignment. Good quiz results should serve as positive feedback, but poor quiz results suggest that you must go back and master that material. Repeatedly failing quizzes will almost certainly lead to failing the course, you must take immediate and corrective action if you ever do poorly on a quiz.

EXAMS

- There will be four midterm exams given throughout the semester, in addition to the final exam. The material on the exams will be similar to topics covered on quizzes and homework.
- Students are required to take all exams at the scheduled hour as they appear on the syllabus and course schedule.
- There will be no late '*make-up*' exams, as this is unfair to the rest of the class. If you know in advance you are going to miss a scheduled exam, let me know well in advance of the exam. Athletes, carefully review our exam schedule looking for conflicts.
- A missed exam will result in the final exam being worth 300 points (you do not lose any points for the missed exam, those points simply roll into the final exam). A second missed exam will receive a grade of 0 (zero).
- Our goal is not simply a 'correct answer'. But rather, you are to demonstrate the extent to which you understand each problem, this means organizing your work, a good write-up includes: connecting your work, proper notation, and an explanation of steps as you see necessary.
- Important Dates to Remember:
 - Exam 1: Friday, February 8th.
 - Exam 2: Friday, March 15th.
 - Exam 3: Friday, April 12th.
 - Exam 4: Friday, May 3rd.
 - Final Exam: Thursday, May 9th, 10:30-12:30 AM.

MATH 112 · TRIG & FUNCTIONS TENTATIVE COURSE SCHEDULE · SPRING 2019

| Monday | Wednesday | Friday |
|---|---|--|
| Jan 14 Course Introduction & Review (P.2, P.3, P.4, P.5) | Jan 16 Review (P.6, P.7) | Jan 18 §§ 1.2 & 1.3: Functions and Graphs <i>Quiz</i> |
| Jan 21 No Class | Jan 23 § 1.4: Linear Functions and Slope § 1.5: More on Slope | Jan 25 § 1.6: Transformations of Functions (1) <i>Quiz</i> |
| Jan 28 § 1.6: Transformations of Functions (2) § 1.7: Composite Functions | Jan 30 Classes Canceled Cold Weather | Feb 1 § 1.8: Inverse Functions § 1.9: Distance Formula, Circles |
| Feb 4 § 2.1: Complex Numbers § 2.2: Quadratic Functions (1) | Feb 6 § 2.2: Quadratic Functions (2) § 2.3: Polynomial Functions | Feb 8 EXAM 1 |
| Feb 11 § 2.4: Dividing Polynomials § 2.5: Zeros of Polynomial Functions (1) | Feb 13 § 2.5: Zeros of Polynomial Functions (2) § 2.6: Rational Functions (1) | Feb 15 § 2.6: Rational Functions (2) |
| Feb 18 § 2.7: Rational Inequalities (1) | Feb 20 § 2.7: Rational Inequalities (2) | Feb 22 § 3.1: Exponential Functions |
| Feb 25 § 3.2: Logarithmic Functions | Feb 27 § 3.3: Properties of Logarithms | Mar 1 § 3.4: Exp & Log Equations (1) |
| Spring Break | | |
| Mar 11 § 3.4: Exp & Log Equations (2) | Mar 13 § 4.1: Angles and Radians | Mar 15 EXAM 2 |
| Mar 18 § 4.2: Trigonometric Functions | Mar 20 § 4.3: Right Triangle Trigonometry | Mar 22 § 4.4 : Trig Functions of Any Angle (1) |
| Mar 25 § 4.4 : Trig Functions of Any Angle (2) | Mar 27 §§ 4.5 & 4.6: Graphs of Trig Functions | Mar 29 § 4.7: Inverse Trig Functions (1) |
| Apr 1 § 4.7: Inverse Trig Functions (2) | Apr 3 § 5.1: Verifying Trig Identities (1) | Apr 5 § 5.1: Verifying Trig Identities (2) |
| Apr 8 § 5.3: Double-Angle and Half-Angle Formulas | Apr 10 § 5.2: Sum and Difference Formulas § 5.4: Product-to-Sum Formulas | Apr 12 EXAM 3 <i>Last day to withdraw</i> |
| Apr 15 § 5.5: Trigonometric Equations (1) | Apr 17 § 5.5: Trigonometric Equations (2) | Apr 19 No Class: Easter Break |
| Apr 22 No Class: Easter Break | Apr 24 § 6.1: The Law of Sines | Apr 26 § 6.2: The Law of Cosines |
| Apr 29 § 7.1: Systems of Linear Equations in Two Variables | May 1 § 7.2: Systems of Linear Equations in Three Variables | May 3 EXAM 4 |
| | Thursday May 9th | FINAL EXAM 10:30 - 12:30 |

SERVICES:

TUTORING

Mercyhurst University and the Mathematics Department provide free tutoring for students enrolled in mathematics courses: *College Algebra* through *Calculus II* (including *Trig and Functions*). Be sure when you go that you have your course materials (book, notebook, pencil, paper, etc). The tutors will assist on a first-come, first-served basis. See: <http://math.mercyhurst.edu/Tutoring/>

SUPPORT OF THE MERCY MISSION

This course supports the mission of Mercyhurst University by creating students who are intellectually creative. Students will foster this creativity by: applying critical thinking and qualitative reasoning techniques to new disciplines; developing, analyzing, and synthesizing scientific ideas; and engaging in innovative problem solving strategies.

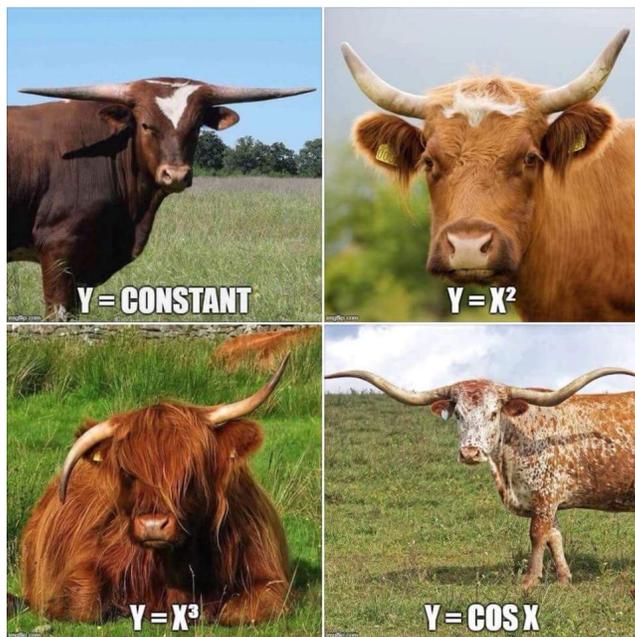
LEARNING DIFFERENCES

Mercyhurst University is committed to making reasonable accommodations to assist individuals with disabilities in reaching their academic potential. Students with disabilities requiring accommodations should complete and submit [this form](#) and the required documentation to the Director of Equal Opportunity Programs (DEOP), aagnew@mercyhurst.edu. Accommodations will not be granted prior to approval by the DEOP and will not be provided retroactively. Further information is available by visiting the Learning Differences website: <http://www.mercyhurst.edu/academics/learning-differences-program>.

ADDITIONAL

(FREE)

RESOURCES



- **Khan Academy Algebra II:**
<https://www.khanacademy.org/math/algebra2>
Includes material on manipulating functions, polynomials, rational functions, complex numbers, and modeling.
- **Wolfram Alpha:** <http://www.wolframalpha.com>
A great way to check your work. Free, with subscription available to access step-by-step solutions to problems.
- **College Algebra Textbook:**
<http://stitz-zeager.com/szca07042013.pdf>
Free textbook by Carl Stitz and Jeff Zeager. Covers functions, graphing, polynomials, rational functions, modeling, exponential and logarithmic functions, and more, with practice exercises and some solutions.
- **Precalculus Textbook:**
<http://www.opentextbookstore.com/precalc/1.5/Precalc.pdf>
Free textbook by David Lippman and Melonie Rasmussen. Covers just about everything in Math 112, in the same sequence.

MATH 112 · SUGGESTED HOMEWORK · FALL 2019

| Section | Exercises |
|---|---|
| Day One § P.2: Exponents § P.3: Radicals and Rational Exponents § P.4: Polynomials § P.5: Factoring Polynomials | → Carefully RE-READ and UNDERSTAND the Syllabus ← 55, 57, 61, 107, 109, 111, 112, 113, 114 51, 53, 80, 89, 97, 99, 111, 112, 113, 114 21, 29, 39, 55, 69, 93, 95 9, 15, 23, 29, 37, 45, 47, 65, 71, 79, 83, 103, 104, 138 |
| § P.6: Rational Expressions § P.7: Equations § 1.2: Basics of Functions and Graphs § 1.3: More on Functions & Graphs | 39, 43, 53, 71, 72, 76, 79, 81, 39, 41, 97, 99, 111, 121, 123, 169 13, 15, 29, 33, 35, 43, 45, 59, 61, 62, 71-75(odd), 81, 85, 89, 93, 122-126 11, 13, 33, 39, 45, 47, 52, 53, 63, 69, 77, 83-91(odd), 90, 92 |
| § 1.4: Linear Functions and Slope | 7, 15, 27, 33, 37, 43, 49, 67, 79, 85 |
| § 1.5: Average Rate of Change § 1.6: Transformations of Functions (1) | 9, 11, 15, 17, 25, 29, 31 (may use calculator for some calculations) 17-23(odd), 33, 35, 36, 53, 55, 145 |
| § 1.6: Transformations of Functions (2) | 47, 48, 57, 59, 67, 69, 71, 77, 146, 147 |
| § 1.7: Composite Functions | 9, 27, 35, 47, 53, 59, 63, 73, 75, 83, 85, 91, 93, 95, 96, 121 |
| § 1.8: Inverse Functions § 1.9: Distance Formula | 3, 5, 7, 17, 19, 25, 27, 28, 29-33(all), 36, 37, 53, 55, 57, 59, 63 35, 45, 53, 57, 59, 63 |
| § 2.1: Complex Numbers § 2.2: Quadratic Functions (1) | 5, 7, 17, 21, 27, 37, 49, 51 5, 7, 11, 17, 41 |
| § 2.2: Quadratic Functions (2) § 2.3: Polynomial Functions | 8, 31, 43, 65, 71 3, 7, 9, 13, 15-18, 23, 25, 31, 37, 43, 47, 57, 67, 69 |
| Exam 1 | |
| § 2.4: Dividing Polynomials § 2.5: Zeros of Polynomial Functions (1) | 9, 11, 13, 15, 27, 29, 43, 44, 45, 52 (you do NOT have to use synthetic Division) 25, 27, 29, 31, 43, 47, 91 |
| § 2.5: Zeros of Polynomial Functions (2) § 2.6: Rational Functions (1) | 46, 48, 51 5, 7, 15-20, 25, 27, 29, 31, 37, 39, 49, 57, 65, 89, 95 |
| § 2.6: Rational Functions (2) | 33, 35, 43, 55, 73, 91, 93, 97 |
| § 2.7: Rational Inequalities (1) | 17, 27, 35, 43, 53, 55, 61, 66, 68, 70 |
| § 2.7: Rational Inequalities (2) | 25, 37, 39, 41, 57, 59, 63, 65, 67, 69 |
| § 3.1: Exponential Functions § 3.2: Logarithmic Functions | 19-24, 35, 39, 41, 42, 51, 61, 63, 64, 88, 90, 91 1, 7, 9, 13, 21, 23, 27, 33, 43, 48-52, 65, 73, 83-101 (odd) 107, 109, 111, 112 |
| § 3.3: Properties of Logarithms | 5, 9, 13, 29, 30, 37, 41, 57, 67, 69, 83, 88, 93, 94, 96, 97, 99, 134(a) Take advantage of this time to get caught up on your weak sections |
| § 3.4: Exponential and Log Equations (1) | 5, 9, 19, 21, 33, 41, 43, 63, 71, 75, 83, 89, 91, 94, 95, 99, 102 |
| § 3.4: Exponential and Log Equations (2) | 16, 22, 37, 42, 45, 64, 79, 87, 92, 93, 97, 100, 101, 117 |
| Exam 2 | |

...continued on the next page...

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| Section | Exercises |
|---|--|
| § 4.1: Angles and Radian Measure | 15, 19, 25, 29, 41, 43, 45, 47, 63, 65, 69, 77, 80, 81 |
| § 4.2: Trig Functions: The Unit Circle | 3, 5, 7, 17, 19, 23, 31, 35, 41, 55, 57, 59, 63, 67, 71, 77 |
| § 4.3: Right Triangle Trigonometry | 1, 7, 9, 11, 19, 29, 33, 35, 53, 56, 57 |
| § 4.4: Trig Functions of Any Angle (1) | 1, 9, 11, 13, 16, 19, 21, 25, 29, 67, 71, 78, 85, 87, 93, 99 Any instructions: "for each of the six trig functions", just work the sin, cos, tan, sec |
| § 4.4: Trig Functions of Any Angle (2) | 27, 31, 33, 89, 91, 95 Any instructions: "for each of the six trig functions", just work the sin, cos, tan, sec |
| § 4.5: Graphs of Sine and Cosine § 4.6: Graphs of Other Trig Functions | 5, 11, 35, 39, 57, 61, 63, 65 1-4 |
| § 4.7: Inverse Trig Functions (1) | 1, 9, 11, 15, 25, 29, 33, 35, 39, 43, 55, 57, 65, 71 |
| § 4.7: Inverse Trig Functions (2) | 41, 45, 61, 63, 67, 69, 72, 79 |
| § 5.1: Verifying Trig Identities (1) | 13, 21, 25, 32, 43, 45, 47, 51, 67 |
| § 5.1: Verifying Trig Identities (2) | 27, 29, 35, 37, 41, 49, 55, 57, 59 |
| § 5.3: Double-Angle and Half-Angle | 1, 5, 7, 13, 23, 27, 29, 31, 51, 59 |
| Exam 3 | |
| § 5.2: Sum and Difference Formulas § 5.4: Product-to-Sum Formulas | |
| § 5.5: Trigonometric Equations (1) | |
| § 5.5: Trigonometric Equations (2) | |
| § 6.1: The Law of Sines | |
| § 6.2: The Law of Cosines | |
| § 7.1: Systems of Linear Equations | |
| § 7.2: Systems of Linear Equations | |
| Exam 4 | |