# MERCYHURST UNIVERSITY

## MATH 112 – Trig and Functions
### Course Syllabus · Spring 2023

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|---|---|---|
| **INSTRUCTOR:** | Roger Griffiths | **OFFICE HOURS:** |
| **OFFICE:** | Old Main 305 | Tues: 09:00 - 10:20 |
| **EMAIL:** | rgriffiths@mercyhurst.edu | Tues: 1:00 - 1:50 |
| **PHONE:** | (814) 824-2123 | Wed: 10:00 - 10:50 |
| **CLASS TIME:** | Mon, Wed, Fri: 2:00 - 2:50, (3 semester credits) | Thur: 08:00 - 09:20 (Zoom) |
| **LOCATION:** | Hirt M214 | Fri: 10:00 - 10:50 |
| **PREREQUISITE:** | College Algebra (M111) or ALEKS Score 60 or higher | |
| **WEB:** | www.integral-domain.org/rgriffiths/courses/m112/ | |
| **TEXT:** | *Precalculus*, (6th Edition) by Robert Blitzer | |

## 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 60 or better on the ALEKS Mathematics Placement Assessment.

## COURSE DESCRIPTION

This course will include a further exploration of functions, exponential functions, logarithmic functions, trigonometry functions and additional topics in trigonometry.

## 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, without the use of a calculator.

- 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.

- 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
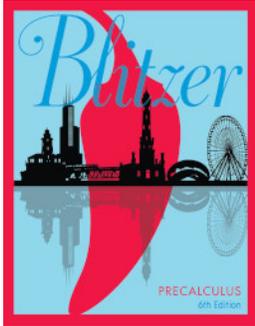
*Precalculus*, 6th Edition, by Robert Blitzer. You will need this textbook, and be sure to check the edition when purchasing your textbook; other editions have similar material, but the assigned problems may be different. No other materials are required for this class. You do NOT need to purchase a subscription to MyLab Math or pay to access any other online resources; so you may purchase a used textbook without the access code. If you prefer to purchase an electronic version of the text or the binder version, you're welcome to do so.

## Moodle

At the beginning of the semester, new Moodle users will receive a code to register for our course on Moodle. This is a free site created for this course by the Mercyhurst Mathematics Department. While most materials will also be posted on Blackboard, you will need to access Moodle for the course quizzes and exams. You will receive an email to your Mercyhurst address with further information on creating your Moodle account.

## Calculators

You will not be required to have a calculator for this class. They are not recommended for this course, and you are strongly encouraged to avoid using a calculator while working on homework.

## 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**  Cumulative 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 |
|---|---|---|
| 630 - 700 | 90 to 100 | A |
| 609 - 629 | 87 to 89 | B+ |
| 560 - 608 | 80 to 86 | B |
| 539 - 559 | 77 to 79 | C+ |
| 490 - 538 | 70 to 76 | C |
| 420 - 489 | 60 to 69 | D |
| 0 - 419 | Below 60 | F |

✓ 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.

✓ Class attendance and/or class participation is not factored into your grade.

✓ 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 this syllabus.

## Course Policies

- ✓ 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.
- ✓ 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.
- ✓ If you miss class, you are responsible for getting the notes from your 'class contact' (see above).
- ✓ If you miss class, you are responsible for getting the class administrative remarks/reminders from your 'class contact'.
- ✓ Email is great for **simple** communications, but more complex issues must be handled during office hours.
- ✓ 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.

## Homework

I do not collect or grade your written homework. You will be held accountable for the mastery of homework problems via the quizzes. 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.

- · **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.

- · 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.

- · 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.

## Quizzes

- · Everyone is allowed to miss one quiz without penalty (for any reason - including forgetting the quiz); thus, there are NO make up quizzes. If you end up taking all of the quizzes, your low quiz score will be dropped.

- · 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 cumulative final exam. The material on the exams will be similar to topics covered on quizzes and homework.

· There will be no late '*make-up*' exams, as this is unfair to the rest of the class.

  – Exams are available for 17 hours, it is your responsibility to set aside time to take the exam during this window.
  – If you know in advance you will not be available during the block of time an exam will be available, let me know well in advance of the exam.
  – It is not a good idea to put off taking the exam until the last hours of availability.

· Your lowest exam grade (including a missed exam) will be replaced by your final exam grade, if your final exam grade is better. A grade of 0 on an exam due to academic dishonesty will not be replaced by the final exam grade. A second missed exam will receive a grade of 0 (zero).

## Quiz and Exam Policies

· All quizzes and exams (including the final exam) will be delivered via Moodle; see next page for further information.
· You will only have one chance to take each quiz/exam.
· You will not be able to change your responses after submitting a quiz or exam.
· If you experience any technical issues with a quiz/exam, let me know as soon as possible; you must let me know before the quiz/exam closes.

### You may:

refer to your textbook and course materials while taking quizzes.

### You may NOT:

· refer to any materials besides the textbook or course materials. This includes solution manuals, web pages, etc. If it is not on Moodle, Blackboard, or in the textbook, do not use it while taking an exam!
· use mathematical software or apps such as Wolfram Alpha, CoCalc, Photomath, or any other utilities.
· ask for help or clarification from a classmate, friend, family member, online service such as Chegg, or anyone besides the instructor of the course.
· assist a classmate that requests help or information about a quiz or exam.

## More Information About Quizzes and Exams on Moodle



Moodle is a Learning Management System, similar to Blackboard, that allows for flexible mathematics based quizzes and exams. We will be using Moodle for all class assessments: quizzes, midterms exams, and the final exam. There is no fee for using Moodle.

### Accessing Moodle

At the beginning of the semester, you will receive an email (delivered to your Mercyhurst email address) with information on enrolling in the Moodle course. You will be required to create a password. Be sure to keep this password safe, and do not share your login information with other students in the course.

There is a mobile app available for Moodle, but it is not recommended for use in this course. A computer (desktop or laptop) or tablet is strongly recommended, as is using the Moodle website as opposed to the app.

## Question Styles

The quizzes and exams you'll take on Moodle are based on homework problems from the textbook. Many questions are multiple choice, and others will require you to enter a numerical answer. When necessary, specific instructions will be provided with a question. Questions will be asked one at a time, so you can focus on each individual question as you work.

## Time Restrictions

You will be required to finish each quiz or exam within a designated period of time (typically, 1 hour for quizzes and 2 hours for exams). Any work you have completed will be submitted at the end of this period, even if you have not finished the assessment.

## Availability Windows

Each quiz and exam can only be submitted during its availability window. You will generally have a 12 hour period in which to complete the quiz or exam on its due date.

Please note that once you begin a quiz or exam, you will be required to complete it within the given time period or before the end of the availability window, whichever comes first. For instance, if you have a 2 hour time limit on an exam that is due by midnight, starting the exam at 11 pm will give you only 1 hour to finish it. Be sure to allow yourself enough time to finish each assessment before you begin.

## Grades

Your quiz and exam grades will be available immediately when the availability window closes. Correct answers and detailed solutions will be available the day after the quiz is available.

Grades will be transferred to Blackboard so you can keep track of your overall progress in the class. The gradebook for the class will be maintained on Blackboard.

## Support

If you have questions or issues with the course itself, or if you encounter any problems with a quiz or exam, please notify me as soon as possible (before the quiz/exam ends).

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# University Resources and Policies

## COVID Related Suggestions

- Face masks are not required, but please feel free to wear one if that is your preference. If you have any sort of cough you are strongly encouraged to wear one.
- A water bottle or cup with a lid (and preferably a straw) is permitted to be used in classrooms and labs.
- If you have a fever, shortness of breath or difficulty breathing, new loss of taste or smell, cough, or feel sick at all, please do not come to our classroom. Your health and the health of the Mercyhurst community is the first priority.

## ADA Accommodations/Academic Support

Mercyhurst University values inclusion and is committed to the goal of providing equal opportunities for all. Mercyhurst abides by federal, state, and local laws in admissions, employment, academic programs, and all services provided.

Mercyhurst University is committed to complying with its obligations under the Americans with Disabilities Act (ADA), Section 504 of the Rehabilitation Act and the Fair Housing Act to ensure that a person with a disability is granted reasonable accommodations, when such accommodations are necessary, to afford that person equal opportunity to obtain a Mercyhurst education and use university facilities. Please refer to the HUB: https://lakersmercyhurst.sharepoint.com/sites/StudentsHub

and select the Services tab, then ADA Accommodations from the dropdown for instructions to request an accommodation. You may also contact Susan Reddinger, ADA Coordinator, ADA@mercyhurst.edu, 814-824-2362, Egan Hall 200.

For students with questions about Academic Support, please refer to the HUB:

https://lakersmercyhurst.sharepoint.com/sites/StudentsHub

and select the Academic Resources tab, then Academic Support for more information.

## TITLE IX SEXUAL MISCONDUCT/SEXUAL HARASSMENT REPORTING

Mercyhurst is committed to providing an environment free from sex discrimination, including sexual harassment and sexual violence. Please refer to the HUB:

https://lakersmercyhurst.sharepoint.com/sites/StudentsHub

and select the Resources tab, then Title IX - Sexual Respect from the dropdown for more information. If you would like to file a sexual misconduct complaint, please contact Ann Miller, Title IX Coordinator and Compliance Officer, titleix@mercyhurst.edu, 814-824-2363. Please be aware that in compliance with Title IX, educators must report incidents of sexual assault/harassment, stalking, and domestic/dating violence. If you disclose any of these situations in class, in papers, or to me personally, I am required to report it to the Title IX Coordinator (or any of the Deputy Title IX Coordinators).
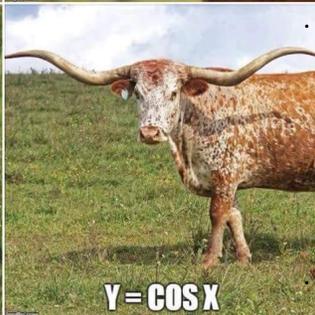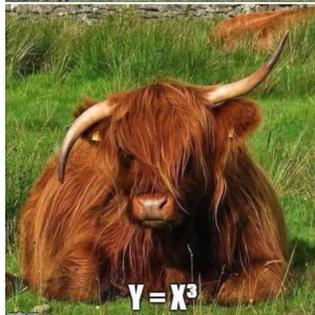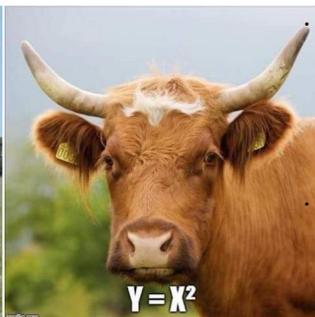
## ACADEMIC HONESTY

Students are required to uphold academic integrity throughout the course. In particular, the use of unauthorized materials or collaboration on quizzes or exams and other incidences of academic dishonesty will be handled according to the policies set forth in the Student Handbook.

## 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.*

| Section | Exercises |
|---|---|
| Day One<br>§ P.2: Exponents<br>§ P.3: Radicals and Rational Exponents<br>§ P.4: Polynomials | → Carefully RE-READ and UNDERSTAND the Syllabus ←<br>55, 57, 61, 107, 109, 111, 112, 113, 114<br>51, 53, 80, 89, 91, 97, 99, 111, 112, 113, 114<br>21, 29, 39, 47, 69, 93, 95 |
| § P.5: Factoring Polynomials<br>§ P.6: Rational Expressions<br>§ P.7: Equations | 9, 15, 23, 29, 37, 45, 47, 65, 71, 79, 83, 103, 104, 138<br>41, 46, 53, 71, 72, 76, 79, 81,<br>39, 41, 97, 99, 111, 121, 123, 131, 169 |
| § 1.2: Basics of Functions and Graphs | 13, 15, 29, 33, 35, 43, 45, 59, 61, 62, 71-75(odd), 81, 85, 89, 93, 122-126 |
| § 1.3: More on Functions and Graphs | 11, 13, 33, 39, 45, 47, 52, 53, 63, 69, 77, 83-91(odd), 90, 92 |
| § 1.4: Linear Functions and Slope<br>§ 1.5: More on Slope | 7, 15, 31, 33, 37, 43, 49, 67, 79, 85<br>1, 5, 9, 11, 21, 25, |
| § 1.5: Average Rate of Change<br>§ 1.6: Transformations of Functions (1) | 15, 17, 29, 31(a) (may use calculator for some calculations)<br>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, 120 |
| § 1.8: Inverse Functions (1) | 3, 5, 7, 17, 19, 25, 27, 28, 29-33(all), 36, 37, 53 |
| § 1.8: Inverse Functions (2)<br>§ 1.9: Distance Formula | 55, 57, 59, 63<br>35, 45, 53, 57, 59, 63 |
| Exam 1 ||
| § 2.1: Complex Numbers<br>§ 2.2: Quadratic Functions (1) | 5, 7, 17, 21, 27, 37, 49, 51<br>5, 7, 11, 17, 41 |
| § 2.2: Quadratic Functions (2)<br>§ 2.3: Polynomial Functions | 8, 31, 43, 65, 71<br>3, 7, 9, 13, 15-18, 23, 25, 31, 37, 43, 47, 57, 67, 69 |
| § 2.4: Dividing Polynomials | 9, 11, 13, 15, 27, 29, 43, 44, 45, 52 (you do NOT have to use synthetic Division) |
| § 2.5: Zeros of Polynomial Functions | 25, 26, 27, 43, 46, 47, 48, 51, 91 |
| § 2.6: Rational Functions (1) | 5, 7, 15-20, 25, 27, 29, 31, 37, 39, 49, 57, 65, 89, 95 |
| § 2.6: Rational Functions (2) | 33, 35, 41, 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 | 19-24, 35, 39, 41, 42, 51, 61, 63, 64, 88, 90, 91 |
| § 3.2: Logarithmic Functions | 1, 7, 9, 13, 21, 23, 27, 33, 43, 48-52, 65, 73, 83-101 (odd) 107, 109, 111, 112 |

| Section | Exercises |
|---------|-----------|
| Exam 2 | |
| § 3.3: Properties of Logarithms | 5, 9, 13, 29, 30, 37, 41, 57, 67, 69, 83, 88, 93, 94, 96, 97, 99, 137<br>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 |
| § 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, 58 |
| § 4.4: Trig Functions of Any Angle (1) | 1, 9, 11, 13, 16, 19, 21, 25, 29, 31, 67, 71, 78, 85, 87, 93, 99<br>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, 32, 33, 89, 91, 95<br>Any instructions: "for each of the six trig functions", just work the $\sin, \cos, \tan, \sec$ |
| § 4.5: Graphs of Sine and Cosine<br>§ 4.6: Graphs of Other Trig Functions | 5, 11, 35, 39, 57, 61, 63, 65<br>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 |
| Exam 3 | |
| § 5.1: Verifying Trig Identities (1) | 13, 21, 25, 32, 43, 45, 47, 51, 54, 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, 11, 13, 23, 27, 29, 31, 51, 59 |
| § 5.5: Trigonometric Equations (1) | 9, 13, 23, 25, 39, 45, 67, 99, 105, 113 |
| § 5.5: Trigonometric Equations (2) | 27, 100, 101, 106, 107, 109 |
| § 7.1: Systems of Linear Equations (1) | 7, 15, 21, 27, 31, 37, 39, 41, 45 |
| § 7.1: Systems of Linear Equations (2) | 60, 61 |
| Exam 4 | |

# MATH 112 · TRIG & FUNCTIONS COURSE SCHEDULE · SPRING 2023

| Monday | Wednesday | Friday |
|---|---|---|
| Jan 16<br>Course Intro & Review (P.2, P.3, P.4) | Jan 18<br>Review (P.5, P.6, P.7) | Jan 20 *Add/Drop Deadline*<br>Finish Review (P.2 - P.7) |
| Jan 23 *Quiz 1*<br>§ 1.2: Functions and Graphs<br>§ 1.3: More on Functions & Graphs | Jan 25<br>§ 1.4: Linear Functions and Slope<br>§ 1.5: More on Slope | Jan 27 *Quiz 2*<br>§ 1.5: Avg Rate of Change<br>§ 1.6: Transformations of Functions (1) |
| Jan 30<br>§ 1.6: Transformations of Functions (2) | Feb 1 *Quiz 3*<br>§ 1.7: Composite Functions | Feb 3<br>§ 1.8: Inverse Functions (1) |
| Feb 6<br>§ 1.8: Inverse Functions (2)<br>§ 1.9: Distance Formula, Circles | Feb 8 **NO CLASS MEETING**<br>EXAM 1 | Feb 10<br>§ 2.1: Complex Numbers<br>§ 2.2: Quadratic Functions (1) |
| Feb 13<br>§ 2.2: Quadratic Functions (2)<br>§ 2.3: Polynomial Functions | Feb 15 *Quiz 4*<br>§ 2.4: Dividing Polynomials | Feb 17<br>§ 2.5: Zeros of Polynomial Functions |
| Feb 20<br>§ 2.6: Rational Functions (1) | Feb 22 *Quiz 5*<br>§ 2.6: Rational Functions (2) | Feb 24<br>§ 2.7: Rational Inequalities (1) |
| Feb 27<br>§ 2.7: Rational Inequalities (2) | Mar 1 *Quiz 6*<br>§ 3.1: Exponential Functions | Mar 3<br>§ 3.2: Logarithmic Functions |
| Spring Break | | |
| Mar 13<br>§ 3.3: Properties of Logarithms | Mar 15 **NO CLASS MEETING**<br>EXAM 2 | Mar 17<br>§ 3.4: Exp & Log Equations (1) |
| Mar 20<br>§ 3.4: Exp & Log Equations (2) | Mar 22 *Quiz 7*<br>§ 4.1: Angles and Radians | Mar 24<br>§ 4.2: Trigonometric Functions |
| Mar 27<br>§ 4.3: Right Triangle Trigonometry | Mar 29 *Quiz 8*<br>§ 4.4: Trig Functions of Any Angle (1) | Mar 31<br>§ 4.4: Trig Functions of Any Angle (2) |
| Apr 3<br>§§ 4.5 & 4.6: Graphs of Trig Functions | Apr 5<br>No Class: Easter Break | Apr 7<br>No Class: Easter Break |
| Apr 10<br>No Class: Easter Break | Apr 12 *Quiz 9*<br>§ 4.7: Inverse Trig Functions (1) | Apr 14<br>§ 4.7: Inverse Trig Functions (2) |
| Apr 17<br>§ 5.1: Verifying Trig Identities (1) | Apr 19 **NO CLASS MEETING**<br>EXAM 3 | Apr 21 *Pass/Fail Deadline* *Quiz 10*<br>§ 5.1: Verifying Trig Identities (2) |
| Apr 24<br>§ 5.3: Double-Angle and Half-Angle Formulas | Apr 26<br>§ 5.5: Trigonometric Equations (1) | Apr 28 *Last day to withdraw* *Quiz 11*<br>§ 5.5: Trigonometric Equations (2) |
| May 1<br>§ 7.1: Systems of Linear Equations in Two Variables (1) | May 3<br>§ 7.1: Systems of Linear Equations in Two Variables (2) | May 5 **NO CLASS MEETING**<br>EXAM 4 |
| Monday May 8 | | |