

SYLLABUS

Code: MATH 153

Title: PRE-CALCULUS MATHEMATICS

Institute: STEM

Department: MATHEMATICS

Course Description: This course, preceded by MATH 152, prepares students for the study of calculus. Problems are approached from a variety of perspectives, including graphical, numerical, verbal, and algebraic. The topics require students to exhibit critical thinking skills as they analyze a variety of problems, create functions from a problem situation, and solve optimization problems using those functions. Trigonometric identities are used as tools for rewriting trigonometric expressions. Types of functions studied include rational, exponential, and logarithmic. Students use their calculators and their understanding of the behavior of functions to perform regression analysis on data sets, including exponential and power functions. Parametric equations are introduced and used to define circles. Conic sections are also introduced. A graphing calculator is required; the specific model is determined by the Mathematics Department.

Section Information: All tests will be proctored in person.

Prerequisites: A grade of C or higher in MATH 152 or equivalent is required as a prerequisite.

Credits: 4

Lecture Hours: 4

Lab: 0

REQUIRED TEXTBOOK/MATERIALS

1. Textbook: Stewart, Redlin, Watson, Precalculus Mathematics for Calculus, 7th edition. Brooks/Cole Cengage Learning, 2015.

Note:

- For textbook information in hybrid sections, see Instructor Addendum.
 - **Enhanced WebAssign (EWA)** will be required for online homework in some sections. Check with your instructor. The College bookstore sells the textbook in a bundle which includes an EWA access code. If you buy a used textbook, an access code can be purchased online at www.cengagebrain.com
2. **Graphing Calculator:** The calculator for this course is the TI-83 (any version) or TI-84 (any version). The use of any other calculator should be discussed with the instructor. The TI-89 and TI-92 may not be used for testing.
 3. **Graph paper**
 4. **Ruler:** You should bring a small ruler to each class.

ADDITIONAL TIME REQUIREMENTS:

There are group projects during the course. You will need to allow some on-campus time during each project to meet with your group.

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OTHER TIME COMMITMENTS:

- In addition to the regular class hours, you will need to set aside time each week for homework. The weekly time will vary by topic and level of difficulty, but as an estimate, you should expect two homework hours for *each* class hour per week. For example, if your class meets for four hours per week, you should expect to spend about **eight** hours per week on homework.
- If you are having any difficulty with the course material, you may need to allow time to see your instructor during office hours or to get help in the Math Lab.

COURSE LEARNING OUTCOMES:

Upon completion of this course, students will be able to:

- Demonstrate the mathematical skills appropriate to this course. (M)
- Identify and distinguish among the following functions: linear, exponential, logarithmic, quadratic, power, polynomial, rational, piecewise, and trigonometric and their transformations and inverses by interpreting verbal, graphical, numerical, and symbolic representations. (M)
- Use the appropriate function model to analyze and solve application problems. (M)
- Interpret solutions in the context of the problem. (M)
- Use a graphing calculator to understand concepts and to explore and solve problems. (M)

Learning Outcome(s) support the following General Education Knowledge Areas:

- (M) Mathematics

GRADING STANDARD: In this course, you will be evaluated by means of tests, quizzes, projects, (and possibly activities and homework).

A. TESTS

There will be three tests, one after each unit. Each test will have two parts: a graphing calculator part and a non-calculator part. All supporting work must be shown on tests in order for your instructor to properly assess your understanding of the material. The tests will be given in class and it is expected that you will be in class to take the test on the day it is given. If you are very ill (verifiable with a doctor's note) or you have some other emergency, you *must* contact your instructor immediately. Each test will be worth 25% of your grade.

Note: All tests will be proctored in person, see Instructor Addendum for more information.

B. QUIZZES/HOMEWORK/ACTIVITIES

There are periodic quizzes in the course and there may be several group activities. Activities are done in groups during class time and may be assessed either individually or as a group assignment. Your instructor may also choose to use homework assignments for evaluation.

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C. PROJECTS

There will be at least three projects for the course, to be done in groups outside of class. In the projects, you will apply the concepts and skills learned in class to a problem situation, present the mathematics, write careful explanations, and interpret your results. Specific guidelines for the projects will be handed out with Project 1.

GRADING

Each test is graded on the basis of 100 points and is worth 25% of your grade. Quizzes, homework, activities, and projects result in a combined grade worth 25% of your grade. Your instructor's addendum will state the exact percentages of each.

FINAL GRADE

Your final grade is determined as follows:

If your final course average is	Your final grade is
90 – 100	A
88 – 89	A ⁻
86 – 87	B ⁺
80 – 85	B
78 – 79	B ⁻
76 – 77	C ⁺
70 – 75	C
60 – 69	D ^{**}
Below 60	F

^{**} To use this course as a prerequisite for another mathematics course, you must have a grade of C or better.

Incomplete

INC is only given at the discretion of your instructor. This may occur in documented cases of hardship or emergency. In this case, you must meet with the instructor to discuss the work that must be completed to earn a grade in the course. All work must be completed within 21 days after the end of the term, exclusive of official college closings.

Withdrawal

You may withdraw from the course, without penalty, up to a date set by the College. If you do not withdraw from the course but stop attending, your grade at the end of the semester will be F.

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COURSE CONTENT: (TEXT SECTION)

Unit 1: In this unit, you will review properties of trigonometric functions, and study various trigonometric identities, as well as solving trigonometric equations. You will also review power and polynomial functions, and study optimization.

Unit 1 Outcomes: You will:

- Demonstrate a knowledge of and proficiency with the trigonometric functions, including graphing, use of identities, and solving equations.
- Know the fundamental trigonometric identities, including all versions of the Pythagorean identities. (7.1)
- Use trigonometric identities to rewrite trigonometric expressions. (7.1 – 7.3)
- Know the addition and subtraction formulas for sine and cosine. (7.2)
- Use the addition and subtraction formulas for sine and cosine to verify trigonometric identities. (7.2)
- Know the double-angle identities for sine and cosine. (7.3)
- Be able to use the half-angle formulas and the formulas for lowering powers. (7.3)
- Use special values to solve trigonometric equations graphically and analytically. (7.4, 7.5)
- Use trigonometric identities to solve trigonometric equations. (7.5)
- Know the definition and notation of a function.
- Know the definition and properties of the following functions: linear, quadratic, power, and polynomial.

Unit 2: In this unit, you will study rational functions in terms of their equations and their graphs. You will also study exponential and logarithmic functions, as well as the skills needed to simplify related expressions and solve equations.

Unit 2 Outcomes: You will:

- Know the definition of a rational function. (3.6)
- Identify the long-run behavior and any horizontal asymptotes of a rational function. (3.6)
- Produce graphical, numerical, and analytic evidence concerning the long-run behavior of a rational function. (3.6)
- Find the zeros and vertical asymptotes of a rational function. (3.6)
- Produce graphical, numerical, and analytic evidence concerning the vertical asymptotes of a rational function. (3.6)
- Graph a rational function by hand by identifying the long-run and short-run behavior of the function. (3.6)
- Know the definition of an exponential function. (4.1)
- Know the properties of the graphs of exponential functions. (4.1)
- Solve exponential equations graphically. (4.2)
- Solve application problems involving exponential functions. (4.1-4.2)
- Define the number e . (4.2)
- Model continuous growth using e . (4.2)
- Graph and write equations of transformations of exponential functions. (4.2)
- Know the definition of a logarithmic function. (4.3)
- Know the properties of the graphs of logarithmic functions. (4.3)
- Graph and write equations of transformations of logarithmic functions. (4.3)
- Convert between exponential and logarithmic form. (4.3)
- Know and apply the properties of logarithms. (4.3-4.4)
- Use the properties of logarithms to solve exponential equations. (4.5)

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- Identify equations that cannot be solved algebraically and solve them graphically or numerically. (4.5)
- Use logarithms to solve applications of exponential functions algebraically, including finding the doubling time or half-life. (4.5)
- Compare the relative growth rates of power, exponential, and logarithmic functions.

Unit 3: In this unit, students will use the knowledge and skills of previous units to create mathematical models from data sets, as well as setting up models of exponential and logarithmic functions. Parametric equations are also introduced and used to define circles. Circles, ellipses, and hyperbolas are covered using the implicit form of their equations. Shifts of each of these conic sections are included. Finally, students will use algebraic and visualization skills to solve problems involving the intersection of two graphs.

Unit 3 Outcomes: You will:

- Create models for applications of exponential functions and analyze them. (4.6)
- Use technology to determine exponential, power, or logistic regression equations for a set of data and decide which one to use in a given situation. (Focus on Modeling, page 392)
- Use a regression equation to approximate or predict function values for a data set and give an opinion about the reliability of that approximation. (Focus on Modeling, page 392)
- Compare the relative growth rates of power, exponential, and logarithmic functions.
- Use a graphing calculator to graph parametric equations and identify the direction of the plot. (8.4)
- Eliminate the parameter in parametric equations (8.4)
- Identify the center and radius of a circle from its equation and graph it by hand and using the graphing calculator. (1.9,8.4)
- Write the equation of a circle given its center and radius. (1.9)
- Write the equation of a circle given its graph. (1.9)
- Identify the focus, directrix, and focal diameter of a parabola given its equation, as well as graphing it. (11.1)
- Write the equation for a parabola given the vertex and either the focus or directrix. (11.1)
- Identify the vertices and foci of an ellipse from its equation as well as the center and lengths of the minor and major axes and graph by hand. (11.2)
- Write the equation of an ellipse given its foci and lengths of the major and minor axes or its foci and vertices. (11.2)
- Write the equation of an ellipse from its graph. (11.2)
- Identify the foci, vertices, and asymptotes of a hyperbola from its equation and graph it by hand. (11.3)
- Write the equation of a hyperbola given sufficient information about its graph. (11.3)
- Create a function that models a given problem situation and use that function to answer questions (including optimization) about the situation.

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DEPARTMENT POLICIES:

The Math Department wants you to be successful in this course. Because of this, we have compiled a list of strategies and behaviors.

Attendance and class participation

- If you want to be successful in this course, attend every class.
- Come to class on time, and stay for the entire class period. If you are late or leave during class, you will miss important class material and you will also distract your classmates and your instructor. (See the Student Conduct Code)
- Turn off your cell phone during class. You and your classmates need to be free from distractions. (See the Student Conduct Code)
- Bring your book and calculator to every class.
- Respect your classmates and your instructor. Listen carefully to questions asked and answers given. Treat all questions with respect.
- Participate fully in class. Volunteer answers, work problems, take careful notes, and engage in discussions about the material. Above all, stay on task.
- Contribute your share to your in-class group work and do your best to make the group experience a positive one for all members.
- Do your own work on tests and quizzes. Cheating will not be tolerated. (See the Academic Integrity Code.)

Homework

- Homework is the way you practice the ideas and skills that are introduced in class. To be successful on the tests, you must do the homework. Homework may be collected and homework questions may be included on quizzes or tests. All the homework assignments are in the homework assignment packet. There is one packet for each unit.
- When you do the homework, write down all supporting work. Using the correct process is at least as important as getting the correct answer, so your work and steps are very important.
- Remember to check your answers. They will be in the back of the text or in the homework packet.
- If there are questions you can't get or don't understand, ask about them at the beginning of the next class. If you have trouble with more than a few problems, try starting your homework in the Math Lab, where help is available.

Absence

- If you are sick and an absence is unavoidable, please call or email your instructor. You are still responsible for all material that was covered during your absence. You are expected to read the textbook and do the homework.
- Make time to see your instructor when you return so that you can get any papers you missed.
- Remember that you are expected to be in class for the tests and quizzes.

Getting Help

After you have tried the homework, there are ways to get help:

- Look in your text and your class notes for examples similar to the problems you are finding difficult.
- See your instructor during office hours or make an appointment. Bring the work

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you have done.

- Go to the **Math Lab** to get extra help on your homework or simply go and do your homework there. Someone will be there if you get stuck. You don't need an appointment to use the Math Lab.
- Form a **study group** with other class members. Working with other students can be a great way to learn. If you have a group to work with, consider meeting and working together in the Math Lab.
- Your textbook may have a complete solutions manual available in the Math Lab, which can be used in the Math Lab.
- You can use the computers in the computer lab within the Math Lab to do work related to your math course.
- In the Math Lab, you can get help on how to use your calculator.

Visit the [Math Lab website](#) to view hours and other useful information about the Math Lab.

COLLEGE POLICIES:

As an academic institution, Brookdale facilitates the free exchange of ideas, upholds the virtues of civil discourse, and honors diverse perspectives informed by credible sources. Our College values all students and strives for inclusion and safety regardless of a student's disability, age, sex, gender identity, sexual orientation, race, ethnicity, country of origin, immigration status, religious affiliation, political orientation, socioeconomic standing, and veteran status. For additional information, support services, and engagement opportunities, please visit www.brookdalecc.edu/support.

For information regarding:

- Academic Integrity Code
- Student Conduct Code
- Student Grade Appeal Process

Please refer to the [Student Handbook](#) and [Catalog](#).

Notification for Students with Disabilities:

Brookdale Community College offers reasonable accommodations and/or services to persons with disabilities. Students with disabilities who wish to self-identify must contact the Accessibility Services Office at 732-224-2730 (voice) or 732-842-4211 (TTY) to provide appropriate documentation of the disability and request specific accommodations or services. If a student qualifies, reasonable accommodations and/or services, which are appropriate for the college level and are recommended in the documentation, can be approved.

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Mental Health:

24/7/365 Resources:

- Monmouth Medical Center Psychiatric Emergency Services at (732) 923-6999
- 2nd Floor Youth Helpline – Available to talk with you about any problem, distress, or hardship you are experiencing. Call or text at 888-222-2228 or visit the website at <https://www.2ndfloor.org/>

Faculty Counselors:

- Students who need to make an appointment with a faculty counselor can do so by calling 732-224-1822 (non-emergency line) during business hours. Faculty counselors are licensed mental health professionals who can assist students and refer them to other mental health resources.

Diversity Statement:

Brookdale Community College fosters an environment of inclusion and belonging. We promote a safe and open culture, encourage dialogue respecting diverse perspectives informed by credible sources, and uphold the virtues of civil discourse. We celebrate all identities with the understanding that ultimately, diversity, equity, and inclusion cultivate belonging and make us a stronger Brookdale community.

**The syllabus is intended to give student guidance in what may be covered during the semester and will be followed as closely as possible. However, the faculty member reserves the right to modify, supplement, and make changes as the need arise.*