Patrick & Henry Community College

MTH 167 G1 PreCalculus with Trigonometry

Spring 2025 INSTRUCTOR: Shannon Harrell

OFFICE LOCATION: P&HCC West Hall, 2nd Floor, Room 202

OFFICE HOURS: M-F 12:30 – 3:00 P.M., or by appointment

OFFICE PHONE: 276 – 656 – 0328, extension 4

E-MAIL ADDRESS: sharrell@pgsmst.com

CLASS MEETING TIME: Monday – Friday 9:25 – 10:55 a.m.

CLASSROOM LOCATION: P&HCC West Hall, 1st Floor, Room 124

COURSE CREDITS: 5

PREREQUISITE(S): Prerequisite: Competency in Math Essentials MTE 1-9 as demonstrated through the placement and diagnostic tests, or by satisfactorily completing the required MTE units or equivalent.

COURSE DESCRIPTION

This is an advanced PreCalculus course that includes the study of algebraic functions such as, linear, quadratic, cubic, logarithmic, exponential, polynomial, rational, trigonometric, and inverse trigonometric functions. Other topics include vectors, matrices, partial fraction decomposition, conics, sequences, series, and introductory calculus topics of limits and derivatives. The course will build on the concepts learned in previous math courses and prepare students for the higher levels of mathematics. The diversity of topics and versatility of the knowledge gained in this course will enable students to solve problems in many fields of study.

Mathematics at the Governor's School provides students with a unique opportunity to investigate and discover many types of functions, their characteristics, and model real life applications using the graphs of various functions. The 4-prong approach is utilized, encouraging students to focus on concepts when they are represented graphically, numerically, analytically, and verbally, and to make connections amongst these representations. An emphasis will be placed on preparing students to use mathematics to problem solve, promote critical thinking, and solve higher-level problems while developing underlying calculus concepts. Technology is used to enhance understanding of concepts and confirm and analyze solutions found algebraically.

COURSE INTRODUCTION

This course begins with an in-depth study of algebraic concepts and their application. The study of trigonometry is a large focus of this course. Trigonometry was developed for astronomy and geography; it is also used in physics, engineering, and chemistry. It is used primarily in calculus; thus a solid foundation is essential for success in that and future math courses. The material covered in this course is intended to prepare the student for their future mathematic endeavors.

A. COURSE OBJECTIVES

Upon successful completion of this course, the student should:

- Develop effective study skills in order to master course content and objectives.
- Demonstrate an understanding of the basic mathematical skills used in applied pre-calculus.
- Communicate clearly and effectively mathematical principles using proper vocabulary.
- Apply the principles and concepts of pre-calculus to solve practical problems in mathematics.

Content Covered

I. Relations and Functions

a. Distinguish between relations and functions.
b. Evaluate functions both numerically and algebraically.
c. Determine the domain and range of functions in general, including root and rational functions.
d. Perform arithmetic operations on functions, including the composition of functions and the difference quotient.
e. Identify and graph linear, absolute value, quadratic, cubic, and square root functions and their transformations.
f. Determine and verify inverses of one-to-one functions.

II. Polynomial and Rational Functions

a. Determine the general and standard forms of quadratic functions.
b. Use formula and completing the square methods to determine the standard form of a quadratic function.
c. Identify intercepts, vertex, and orientation of the parabola and use these to graph quadratic functions.
d. Identify zeros (real-valued roots) and complex roots, and determine end behavior of higher order polynomials and graph the polynomial, and graph.
e. Determine if a function demonstrates even or odd symmetry.
f. Use the Fundamental Theorem of Algebra, Rational Root test, and Linear Factorization Theorem to factor polynomials and determine the zeros over the complex numbers.
g. Identify intercepts, end behavior, and asymptotes of rational functions, and graph.
h. Solve polynomial and rational inequalities.
i. Interpret the algebraic and graphical meaning of equality of functions ($f(x) = g(x)$) and inequality of functions ($f(x) > g(x)$)
j. Decompose partial fractions of the form $P(x)/Q(x)$ where $Q(x)$ is a product of linear factors.

III. Exponential and Logarithmic Functions

a. Identify and graph exponential and logarithmic functions and their transformations.
b. Use properties of logarithms to simplify and expand logarithmic expressions.
c. Convert between exponential and logarithmic forms and demonstrate an understanding of the relationship between the two forms.
d. Solve exponential and logarithmic equations using one-to-one and inverse properties.
e. Solve application problems involving exponential and logarithmic functions.

IV. Systems of Equations

a. Solve three variable linear systems of equations using the Gaussian elimination method.

V. Trigonometric Functions

a. Identify angles in standard form in both degree and radian format and convert from one to the other.
b. Find the arc length.
c. Find the value of trigonometric functions of common angles without a calculator using the unit circle and right triangle trigonometry.
d. Use reference angles to evaluate trig functions.
e. Find the value of trigonometric functions of angles using a calculator.
f. Use fundamental trigonometric identities to simplify trigonometric expressions.
g. Graph the six trigonometric functions using the amplitude, period, phase and vertical shifts.
h. Use trig functions to model applications in the life and natural sciences.

VI. Analytic Trigonometry

a. Use the fundamental, quotient, Pythagorean, co-function, and even/odd identities to verify trigonometric identities.
b. Use the sum and difference, double angle, half-angle formulas to evaluate the exact values of trigonometric expressions.
c. Determine exact values of expressions, including composite expressions, involving inverse trigonometric functions.
d. Solve trigonometric equations over restricted and non-restricted domains.

VII. Applications of Trigonometry

a. Solve right triangles and applications involving right triangles.
b. Use the Law of Sines and Cosines to solve oblique triangles and applications.
c. Apply concepts of trigonometry to extended topics such as plotting polar coordinates, converting rectangular and polar coordinates from one to the other, identifying vector magnitude and direction, or performing operations with vectors such as addition, scalar multiplication, component form, and dot product.

VIII. Conics

a. Identify the conic sections of the form: $Ax^2 + By^2 + Dx + Ey + F = 0$.
b. Write the equations of circles, parabolas, ellipses, and hyperbolas in standard form centered both at the origin and not at the origin.
c. Identify essential characteristics unique to each conic.
d. Graph equations in conic sections, centered both at the origin and not at the origin.
e. Solve applications involving conic sections.

B. VCCS CORE COMPETENCIES

Degree graduates will demonstrate the ability to

1.1 Understand and interpret complex materials;
2.6 Use problem solving skills;
4.1 Determine the nature and extent of the information needed;
4.2 Access needed information effectively and efficiently;
6.1 Use logical and mathematical reasoning within the context of various disciplines;
6.2 Interpret and use mathematical formulas;
6.3 Interpret mathematical models such as graphs, tables and schematics and draw inferences from them;
6.4 Use graphical, symbolic, and numerical methods to analyze, organize, and interpret data;
6.5 Estimate and consider answers to mathematical problems in order to determine reasonableness; and
6.6 Represent mathematical information numerically, symbolically, and visually, using graphs and charts.

C. METHOD OF INSTRUCTION

A variety of instructional methods will be utilized throughout this course. Students will be introduced to the mathematical concepts in the classroom via lecture, cooperative learning, and exploration. As a group, we will work extensively on study habits, appropriate use of the graphing calculators, and student communication – both oral and written. Students will be encouraged to actively participate in the learning process to help ensure comprehension of the material. Many examples will be provided through lecture and class activities. **The use of e-mail, Canvas, and Thinkwave is essential.**

D. TEXTBOOK(S) AND REQUIRED TOOLS OR SUPPLIES

PreCalculus 10th Edition
Ron Larson
Cengage Learning, 2018

- Pencils
- Loose-leaf notebook paper (lots!)
- Graph paper (lots!)
- Three-ring binder, 3 – 4"
- Dividers for three-ring binder (one set with 4 tabs labeled notes, quizzes, tests, and activities/projects)
- TI-84 Graphing calculator (you can borrow one from the school with a completed loan form)

E. STUDENT EVALUATION

Grades will be calculated using the points system (i.e. $\frac{points\ earned}{points\ possible}$ x 100). Each assignment's point value will be determined by the level of difficulty. Students will be assessed in various ways, including, but not limited to, homework assignments, activities, assessments, and projects.

- **Homework:**
  - For each lesson, students will be provided a note sheet and practice problems to complete for homework.
  - Students will discuss homework daily with a study partner. This will be followed by a class discussion led by the instructor.
  - Homework should be kept in a three-ring binder and should be organized chronologically. The student's name should be on the top right corner of every page.
  - There are no points associated with completing homework, but feedback will be provided to ensure that students understand the content. **Completing practice problems is essential to learning and understanding the content for this course.**

- **Assessments:**
  - One or two closed-book quizzes will be given in each unit, usually covering two or three sections of the chapter. These quizzes will be announced and will be a combination of multiple choice and free-response questions.
  - Quizzes will be completed in class and will be taken individually without the use of notes or other resources.
  - **Quizzes will be worth 50 points**.

  - A test will be given at the end of each unit. Tests are a combination of multiple choice and free-response questions.
  - Tests will be completed in class and will be taken individually without the use of notes or other resources.
  - **Tests will be worth 100 points**.

- **Projects:**
  - Students will be assigned projects throughout the semester to assess students' mastery of course content.
  - Depending on the level of difficulty, projects will be worth 50 points or 100 points as specified on the grading rubric provided with the project guidelines.
  - Projects not submitted by the due date will incur a 20% deduction per day after the due date.

- **Exam:**
  - An exam will be given at the end of the semester and will count 20% of the semester grade.

There are a few policies regarding final exams found in the Governor's School student handbook:

Semester Exam Policy

All students are expected to take semester exams on the day scheduled. Only in a rare case, such as illness confirmed by a physician, death in the family, or a required base school activity confirmed by a student's principal will a make-up be allowed. **All exceptions to the examination schedule must be approved ahead of time by the Director.** If a student does not report for a semester examination due to an emergency, the Governor's School office must be notified on the day of the exam by the student's parent/guardian. Failure to follow this policy may result in a grade of zero (0) for the exam.

F. GRADING SCALE:

A	90 - 100
B	80 - 89
C	70 - 79
D	60 – 69
F	59 – below

Final grade for the course is calculated as follows:
Grading Quarter 1: 40%
Grading Quarter 2: 40%
Final Exam: 20%

A student earning a grade of C or higher will earn college credit for this course.

G. EXPECTATIONS FOR STUDENT SUCCESS

Attendance

- **<u>Students should email the instructor when missing a class to obtain the notesheet and/or any missed assignment(s).</u>**
- Students should see the instructor the day he/she returns from a missed class to ask questions pertaining to the lecture and/or assignment.
- Students should make arrangements to make up any assessment that is missed due to absence.

- Students should submit a note to Mrs. East within 24 hours of the student's return with a valid reason for student's absence. **No make-up work will be allowed for unexcused absences and any assignment for that day will receive a zero**.

Submitting Work

- All assignments should be saved as "last name_first initial_assignment name".
- Students should submit all work by the due date. **If absent for any reason, the assignment should be scanned in as a pdf and emailed to the instructor.**
- All assignments that must be submitted electronically, i.e. projects or activities, should be turned in as **one document**, Microsoft Word or PDF. **The document can contain multiple pages if necessary, however, it should not be multiple attachments. If multiple attachments are submitted, then only the content in the first attachment will be graded.**

Check Grades

- Although all course content is delivered and posted using Canvas, grades will be entered in ThinkWave. Please make sure to check these every day. If there is a problem, see me immediately. DO NOT wait until the end of the grading quarter to discuss a problem.
- If you are caught cheating, the grade for that assignment will be a zero.

Class Atmosphere

- **Students should show respect for classmates and the instructor, listen carefully, and not interrupt someone who is talking.**
- **Cell phones and personal electronic devices, including smartwatches, headphones, and any device that connects to phones, are not allowed during the bell-to-bell school day. Devices must be turned off and stored in a backpack or purse, not on the student. Disciplinary action will be taken against any student found in possession of a cell phone or personal electronic device, including smartwatches, headphones, and any device that connects to phones during restricted times or in violation of school policies.**
- **Students should abide by all rules as outlined in the student handbook.**
- **Students may have food and drinks in the classroom; however, students must leave their area clean.**
- **Students should respond to any emails that you receive from the instructor (individual or group emails should be answered).**

WHAT A STUDENT CAN EXPECT FROM THE INSTRUCTOR

- Continuous support, assistance, and encouragement.
    - **Access to all lessons**. Lessons will be recorded, uploaded to YouTube, and the link will be posted on a Google Doc. Access to the Google Doc is available on Canvas.
    - **One-on-one tutoring**. The instructor will be available between classes and after governor's school for tutoring. Tutoring is available at other times by appointment. Please email if you would like to set up a time to meet to work on specific questions or topics/concepts.

- **Timely responses to emails**. Students should **email the instructor using their pgsmst email accounts and emails should be sent to sharrell@pgsmst.com.** I check my email frequently each day, Monday – Friday, to answer any questions about homework, assignment clarification, etc., and I will answer within 24 hours. I check my email sporadically on Saturday and Sunday and will respond within 48 hours.

- Feedback
  - The instructor will evaluate routine assignments within 72 hours. For more involved projects or assignments, expectations will be communicated with students regarding grading and feedback.

H. EMERGENCY INFORMATION

In case of emergency students should exit the classroom, turn left, and then turn left to exit the building through the automatic doors. Students should proceed quickly and quietly to the far end of the parking lot adjacent to Stone Hall.

I. STUDENT SUPPORT/DISABILITY STATEMENT:

Patrick & Henry Community College makes every effort to accommodate individuals with disabilities for all programs, services, and activities available to the public.

J. IMPORTANT DATES TO REMEMBER:

The **school calendar** is available in the student handbook and at the following link: www.pgsmst.com.

***** PGSMST does not follow the Henry County nor Martinsville calendars, so be sure to check the governor's school calendar. Henry County/Martinsville work days do not impact classes at Piedmont Governor's School.*****

K. SPECIFIC COLLEGE POLICIES

Academic Honesty

Students are expected to abide by the code of conduct and academic integrity found in the student handbook. Students will be required to sign a pledge on any take-home quizzes/tests stating *"On my honor, I have neither given nor received aid on this assignment."* Infractions of the honor code will not be tolerated and will be reported to the director and will be addressed with the student and his/her parent(s)/guardian(s). All violations of academic integrity will also be reported to each student's honor organization.

Inclement Weather

- If Henry County Schools are delayed one hour, Governor's School will open one hour late.
- If Henry County Schools are delayed two hours, Governor's School classes will be canceled.
- If Henry County Schools are closed, Governor's School is closed, and classes do not meet.
- If Patrick Henry Community College is closed, Governor's School will be closed.
- One common question asked is "If my base school is closed but roads in my residential area are clear, should I come to Governor's School?" The decision to attend under those circumstances should be made by the parent(s)/guardian(s).

Assignments and/or lectures may be posted on Canvas on days when Governor's School classes are affected by inclement weather. It is the student's responsibility to check Canvas and complete the assignments before their next class meeting.

L. RESOURCES

- BRAIN FUSE is an online tutoring service and is embedded into Canvas. Click on the course and select "Brainfuse tutoring" from the main screen, left sidebar, to have access to a live tutor.

  brainfuse empower learning is an online tutoring service which gives students 24/7 access to highly qualified, experienced, and specially trained tutors. Virtual whiteboard technology lets students and tutors share the same screen. Students may submit writing assignments to be evaluated / proofread. All live sessions with tutors and submitted questions are saved so students can view or print them out. Any PHCC student can access Brainfuse ***free*** of charge. Brainfuse can only be accessed through Canvas. Further information may be obtained from your instructor or the Writing Center Tutors.

- Testing Center
  The P&HCC testing center is located in the LRC.

  Testing Center Normal Hours

  Monday - Wednesday: 8am - 5pm *[students will not be admitted after 4pm]*
  Thursday: 8am - 7pm *[students will not be admitted after 6pm]*
  Friday: 8am - 5pm *[students will not be admitted after 4pm]*
  Saturday: 9am - 1pm *[students will not be admitted after 12 Noon]*

  Please be advised: *Testing Center staff reserve the right to close the center one hour before the posted closing time if no students are present.*

  Due to staffing limitations, Testing Center hours may change on short notice. Students may call the testing center at **276-656-0358** to verify the current operating hours before arriving for an exam.

- P&HCC Math Lab
  The P&HCC Math Lab is located in the LRC. Hours for this lab change each semester and are posted in the lab and on the P&HCC website (academics>math resources). Experienced math tutors are always available in the math lab to assist students with their math. In addition, the math lab has computers available for student use. The P&HCC tutoring coordinator can be reached at 276-656-5496 to schedule free, individual tutoring.

- Some other resources for tutoring are as follows:
  - Canvas – Teacher instructional videos on Google Doc
  - Youtube
  - Khan Academy
  - Teacher Tube

M. AFFIDAVIT

My signature below indicates that I have read and understand this syllabus.

Student Name _____ Parent/Guardian Name _____

Student Signature _____ Parent/Guardian Signature _____

Date _____ Date _____

Note: ***This syllabus is subject to change at the discretion of the instructor. It is the responsibility of the student to keep abreast of these changes.***

This syllabus conforms to the Patrick & Henry Community College syllabus guidelines.