

**Northern Virginia Community College**  
**MTH 167-002A, Fall 2024**  
**Precalculus with Trigonometry, 5 credits**  
**Dr. Bruce Wahl, Professor**

**Office and Some Ways to Contact Me:**

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**Student Hours:**

**Office Only (AA 352):** Tuesdays and Thursdays: 8:30 AM to 9:15 AM and 11:15 AM to 12:30 PM

**Simultaneously in office (AA 352) and on Zoom:** Mondays and Wednesdays: 10:15 AM to 12:30 PM; Tuesdays and Thursdays: 2:15 PM to 3:00 PM. You are welcome to see me in person in my office or log on to the Zoom Student Hours. You will find the Zoom invitation in CANVAS. I have a waiting room for that Zoom session, so I will watch for you there. Please be patient as there may be other students waiting ahead of you.

**Lecture Time and Delivery:** Mondays and Wednesdays: 12:45 PM to 3:10 PM in AA 457

**Non-Instructional Days:** September 2, October 14-15, November 5, November 27-31

**Course Purpose and Description:**

The purpose of MTH 167 is to prepare students for the skills and level of rigor needed for successful study in a sequence of courses in calculus with analytic geometry (MTH 263, 264, and 265 at NOVA). MTH 167 presents topics in power, polynomial, rational, exponential, and logarithmic functions, systems of equations, trigonometry, and trigonometric applications, including Law of Sines and Cosines, and an introduction to conics. This is a Passport and USGS transfer course. The prerequisites are a satisfactory score on an appropriate proficiency examination or completion of developmental mathematics through Unit 9 or its equivalent. Students cannot get credit for both MTH 161/162 and MTH 167. You may read the complete course content summary at <https://www.nvcc.edu/dist/files/sites/academics/summaries/MTH167.pdf>

**Course Objectives:**

- Relations and Functions
  - Distinguish between relations and functions.
  - Evaluate functions both numerically and algebraically.
  - Determine the domain and range of functions in general, including root and rational functions.
  - Perform arithmetic operations on functions, including the composition of functions and the difference quotient.
  - Identify and graph linear, absolute value, quadratic, cubic, and square root functions and their transformations.
  - Determine and verify inverses of one-to-one functions.
- Polynomial and Rational Functions
  - Determine the general and standard forms of quadratic functions.
  - Use formula and completing the square methods to determine the standard form of a quadratic function.
  - Identify intercepts, vertex, and orientation of the parabola and use these to graph quadratic functions.
  - Identify zeros (real-valued roots) and complex roots, and determine end behavior of higher order polynomials and graph the polynomial, and graph.
  - Determine if a function demonstrates even or odd symmetry.
  - Use the Fundamental Theorem of Algebra, Rational Root test, and Linear Factorization Theorem to factor polynomials and determine the zeros over the complex numbers.
  - Identify intercepts, end behavior, and asymptotes of rational functions and graph.
  - Solve polynomial and rational inequalities.
  - Interpret the algebraic and graphical meaning of equality of functions ( $f(x) = g(x)$ ) and inequality of functions ( $f(x) > g(x)$ )
- Exponential and Logarithmic Functions
  - Identify and graph exponential and logarithmic functions and their transformations.
  - Use properties of logarithms to simplify and expand logarithmic expressions.

- o Convert between exponential and logarithmic forms and demonstrate an understanding of the relationship between the two forms.
- o Solve exponential and logarithmic equations using one-to-one and inverse properties.
- o Solve application problems involving exponential and logarithmic functions.
- Systems of Equations
  - o Solve three variable linear systems of equations using the Gaussian elimination method.
- Trigonometric Functions
  - o Identify angles in standard form in both degree and radian format and convert from one to the other.
  - o Find the arc length.
  - o Find the value of trigonometric functions of common angles without a calculator using the unit circle and right triangle trigonometry.
  - o Use reference angles to evaluate trig functions.
  - o Find the value of trigonometric functions of angles using a calculator.
  - o Use fundamental trigonometric identities to simplify trigonometric expressions.
  - o Graph the six trigonometric functions using the amplitude, period, phase and vertical shifts.
  - o Use trig functions to model applications in the life and natural sciences.
- Analytic Trigonometry
  - o Use the fundamental, quotient, Pythagorean, co-function, and even/odd identities to verify trigonometric identities.
  - o Use the sum and difference, double angle, half-angle formulas to evaluate the exact values of trigonometric expressions.
  - o Determine exact values of expressions, including composite expressions, involving inverse trigonometric functions.
  - o Solve trigonometric equations over restricted and non-restricted domains.
- Applications of Trigonometry
  - o Solve right triangles and applications involving right triangles.
  - o Use the Law of Sines and Cosines to solve oblique triangles and applications.
- Conics
  - o Identify the conic sections of the form:  $Ax^2+By^2+Dx+Ey+F=0$ .
  - o Write the equations of circles, parabolas, ellipses, and hyperbolas in standard form centered both at the origin and not at the origin.
  - o Identify essential characteristics unique to each conic
  - o Graph equations in conic sections, centered both at the origin and not at the origin.
  - o Solve applications involving conic sections
- Sequences and Series (Optional unit at the discretion of the department. Not required for transfer.)
  - o Identify the terms of geometric sequences.
  - o Find a particular term of geometric sequence.
  - o Determine the formula for the  $a_n$  term of geometric sequences.
  - o Find the sum of first n terms of finite geometric series.
  - o Find the sum of infinite geometric series.
  - o Introduce arithmetic concepts as time allows.

**Optional Textbook (please note that this text is embedded in the required online software):**

Miller, J., & Gerken, D. (2023). *Precalculus*. McGraw Hill LLC.

**Required Online Software: ALEKS**

This Fall 2024 Semester, NOVA has implemented the NOVA All Access program for course materials. Everyone will have access to ALEKS in our CANVAS course. Note that you may opt out of the All Access program, but then you will have to purchase your access to the required ALEKS program (approximately two weeks after the course begins).

To access ALEKS, go to CANVAS and click on our course. The page that comes up should have “Recent Announcements” at the top where you will find a “Welcome” announcement from me. Below the announcements, you will find a Module titled “ALEKS Information.” Within that Module, you will find “Getting Started with ALEKS.” Take a few minutes to look through that material where you will discover how to set up your ALEKS account and how to log in to our class on ALEKS. Then, you will click on the “ALEKS” link in the left-hand navigation column in CANVAS and follow the directions to create an account as a new student or select the option that says you have an ALEKS account. This gives you access to ALEKS online resources and an eText.

**Calculator:** A graphing calculator is required for this course. I strongly recommend a TI-83 or better. See the note below.

**Smartphone Scanner App:** You may need to use a free smartphone scanner app (like Genius Scan—you should watch the 22 second video at <https://thegrizzlylabs.com/genius-scan/>) to scan some of your work this semester.

**Syllabus:**

Chapter 1: §§2, 3, 6-8

Chapter 4: §§1-7

Chapter 8: §§1, 2

Chapter 2: §§1-7

Chapter 5: §§1-5

Chapter 10: §§1-3

Chapter 3: §§1-6

Chapter 6: §§1-3

**Grading Policy:** There are 4 components that will determine your grade:

1. Attendance—5%
2. Homework (Most of it is on ALEKS)—15%
3. Unit Exams (4 given, 1 hour each, lowest exam grade dropped)—50%
4. Final Exam (100 minutes, comprehensive)—30%

- In general, 90%-100% = A, 80%-89.9% = B, 70%-79.9% = C, 60%-69.9% = D, below 60% = F. I reserve the right to lower the curve but will not raise the curve. No audits are given in this class. The last day to drop with refund is September 12, 2024. The last day to withdraw to receive a "W" grade is November 4, 2024. If you choose to drop or withdraw from this class, you are responsible for doing all the necessary steps online before these dates. **Note: I will not approve withdrawals after November 4, 2024 without written documentation.**

- **Attendance:** Attending this class is very important. You may miss two classes with no grade penalty. Each class missed after that will result in a 1% drop from the possible 5% attendance grade. My experience is that students who miss class often are putting their education at a low priority and that they are more likely to fail or withdraw from the course. On the other hand, regular attendance with active class participation usually results in a passing grade.

- **Homework:** All mathematics homework will be completed on ALEKS, the online software. Some extra homework related to the class will be detailed in CANVAS. **15% of your grade depends on you making steady progress through the software and exam questions will be based on the types of problems in the homework. See the schedule at the end of the syllabus for tentative dates.**

- **Unit Exams:** One hour each, covering sections as listed below and on the written homework page.

Exam #1 (Unit 1) is tentatively scheduled for September 16, 2024.

Exam #2 (Unit 2) is tentatively scheduled for October 7, 2024.

Exam #3 (Unit 3) is tentatively scheduled for November 4, 2024.

Exam #4 (Unit 4) is tentatively scheduled for December 2, 2024.

If you know you will not be able to complete the exam during class time on any of these days (for example, for required military duty), please see me well in advance; we may be able to make alternate plans. You may miss *one* exam and that will be your dropped score. You may miss a *second* exam with a valid excuse and take a makeup exam. All makeup exams will be given in the final week of class (December 4-10, 2024). It is your responsibility to schedule the make-up exam with me! The exam will cover the same material as the original but will be an oral exam scheduled in a classroom. More than two missed exams will result in scores of 0 for those exams.

- **Final Exam:** On Wednesday, December 11, 2024, the final exam will be given from 12:00 noon to 1:40 PM. The exam will be comprehensive—covering all material we covered in the fifteen weeks. **All students are expected to attend the final exam on Wednesday, December 11, 2024, from 12:00 noon to 1:40 PM.**
- **Exams are individual efforts. Any proof of cheating on an exam results in a score of 0 on that exam, and that score will not be dropped. Cheating includes both receiving and giving help. Cheating also includes invalid absences for exams.**

**Notes:**

1. You are responsible for your own attendance. If you miss a class, you are responsible for reviewing the material in the textbook or online (there are lots of good lecture videos on YouTube) and getting notes from a classmate.
2. It is **required** that you have a TI-83 or better graphing calculator for this class. You may not use cell phones or any other connected devices as calculators on exams. I will allow you to use any calculator on most exams, so it is to your advantage to purchase one. I have several different models of TI calculators. I **strongly** encourage you to invest in a TI. **Note:** I have had other students in the past buy the cheaper models and they were disappointed when they saw how easy the TI's were to use. Please consider this in your choice. It is up to you to purchase a calculator and to practice using it.
3. Doing homework is vitally important in any course you take! Especially in math, it is important to do homework every day. Homework includes reading the textbook and doing the problems in the chapter text, doing assigned problems, attending help sessions and student hours, and participating in a study group. I expect a **minimum of ten (10) hours per week in homework**—the “2 for 1” rule—you put in at least two hours of study for every one hour of class per week. Note that this is a minimum time—you may need to put in significantly more time into this class to be as successful as you want to be! Please remember that I have 10 Student Hours a week in which I can help you in person or on Zoom. The Academic Success Center (ASC) in Bisdorf (AA) 229 also has tutoring. You can find their information at <https://blogs.nvcc.edu/asc/>.
4. Special Needs and Accommodations. Please address with me any special problems or needs at the beginning of the semester. If you are seeking accommodations based on a disability, you must provide a disability data sheet, which can be obtained from the counselor for special needs, (703) 845-6301.
5. Please see the “NOVA Policies” link on CANVAS for more information from the college on topics like Academic Integrity, Withdrawal Policies, and Wellness and Mental Health.

**CLASS SCHEDULE**

| DATE | TOPICS  | TEXT | ALEKS Due Date  |
|------|---|------|---|
| 8/26 | Introduction and Functions and Relations                                      | 1.3  | Complete Initial Knowledge Check<br>ALEKS 1.3 Due 9/1 |
| 8/28 | Transformations of Graphs   | 1.6  | 9/4   |
| 9/4  | Analyzing Graphs of Functions & Piecewise-Defined Functions                   | 1.7  | 9/9   |
|      | Algebra of Functions & Function Compositions (begin)                          | 1.8  | 9/11  |
| 9/9  | Algebra of Functions & Function Compositions (finish)                         | 1.8  | 9/11  |
|      | Quadratic Functions & Applications  | 2.1  | 9/13  |
| 9/11 | Review 1.3, 1.6, 1.7, 1.8, 2.1  |      | Unit 1 Last Chance Due 9/16                           |
|      | Introduction to Polynomial Functions  | 2.2  | 9/18  |
| 9/16 | <b>Before Exam:</b> Division of Polynomials & The Remainder & Factor Theorems | 2.3  | 9/20  |
|      | <b>Exam #1 (1.3, 1.6, 1.7, 1.8, 2.1)</b>                                      |      |   |
| 9/18 | Zeros of Polynomials  | 2.4  | 9/23  |
| 9/23 | Introduction to Rational Functions  | 2.5  | 9/25  |
|      | Graphs of Rational Functions (begin)  | 2.6  | 9/30  |
| 9/25 | Graphs of Rational Functions (finish)   | 2.6  | 9/30  |
|      | Polynomial & Rational Inequalities  | 2.7  | 10/1  |
| 9/30 | Systems of Linear Equations in Two Variables                                  | 8.1  | 10/3  |
|      | Systems of Linear Equations in Three Variables                                | 8.2  | 10/5  |

| DATE  | TOPICS   | TEXT         | ALEKS Due Date              |
|-------|--|--------------|-----------------------------|
| 10/2  | Review 2.2 to 2.7 and 8.1, 8.2                         |              | Unit 2 Last Chance Due 10/7 |
|       | Inverse Functions                                      | 3.1          | 10/9                        |
| 10/7  | Before Exam: Exponential Functions                     | 3.2          | 10/11                       |
|       | <b>Exam #2 (2.2 to 2.7 and 8.1, 8.2)</b>               |              |                             |
| 10/9  | Logarithmic Functions                                  | 3.3          | 10/16                       |
|       | Properties of Logarithms (begin)                       | 3.4          | 10/21                       |
| 10/16 | Properties of Logarithms (finish)                      | 3.4          | 10/21                       |
|       | Exponential & Logarithmic Equations & Applications     | 3.5          | 10/22                       |
| 10/21 | Modeling with Exponential & Logarithmic Functions      | 3.6          | 10/23                       |
|       | The Circle   | 1.2          | 10/25                       |
| 10/23 | Angles and Their Measure                               | 4.1          | 10/28                       |
|       | Trig functions on the Unit Circle                      | 4.2          | 10/29                       |
| 10/25 | Right Triangle Trigonometry                            | 4.3          | 10/30                       |
|       | Applications of Right Triangles                        | 6.1          | 11/1                        |
| 10/30 | Review 3.1 to 3.6, 1.2, 4.1 to 4.3, and 6.1            |              | Unit 3 Last Chance Due 11/4 |
|       | Trigonometric Functions of Any Angle                   | 4.4          | 11/6                        |
| 11/4  | Before Exam: Graphs of Sine & Cosine Functions (begin) | 4.5          | 11/11                       |
|       | <b>Exam #3 (3.1 to 3.6, 1.2, 4.1 to 4.3, and 6.1)</b>  |              |                             |
| 11/6  | Graphs of Sine & Cosine Functions (finish)             | 4.5          | 11/11                       |
|       | Graphs of Other Trigonometric Functions                | 4.6          | 11/12                       |
| 11/11 | Inverses Trig Functions                                | 4.7          | 11/13                       |
|       | Fundamental Trigonometric Identities                   | 5.1          | 11/15                       |
| 11/13 | Sum & Difference Formulas                              | 5.2          | 11/18                       |
|       | More Formulas  | 5.3 &<br>5.4 | 11/19                       |
| 11/18 | Trigonometric Equations                                | 5.5          | 11/20                       |
|       | Law of Sines (begin)                                   | 6.2          | 11/25                       |
| 11/20 | Law of Sines (finish)                                  | 6.2          | 11/25                       |
|       | Law of Cosines   | 6.3          | 11/27                       |
| 11/25 | Review 4.4 to 5.5, 6.2, 6.3                            |              | Unit 4 Last Chance Due 12/2 |
|       | The Ellipse  | 10.1         | 12/4                        |
| 12/2  | Before Exam: The Hyperbola                             | 10.2         | 12/6                        |
|       | <b>Exam #4 (4.4 to 5.5, 6.2, 6.3)</b>                  |              |                             |
| 12/4  | The Parabola   | 10.3         | 12/9                        |
| 12/9  | Review   |              |                             |
| 12/11 | <b>FINAL EXAM 12:00 noon to 1:40 PM</b>                |              |                             |

**NOTE: ALL INFORMATION IN THIS SYLLABUS IS SUBJECT TO CHANGE!**