Northern Virginia Community College

MTH 173-003A (20327) **CALCULUS with Analytic Geometry I (5 CR.)** **Fall 2017**

Syllabus

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Office: Bisdorf, Room AA 352

Class Time: Mondays and Wednesdays 3:30 PM - 5:45 PM.
Classroom: Bisdorf , AA 456

Office hours: Monday 2:30 PM-3:30 PM, 6:00 PM-7:00 PM
Tuesday 3:00 PM-5:00 PM, 7:30 PM-8:30 PM
Wednesday 2:30 PM-3:30 PM, 6:00 PM-7:00 PM
Thursday 3:00 PM-5:00 PM, 7:30 PM-8:30 PM

Important Dates

Classes begin	**August 21**
Drop a class on NOVAConnect with tuition refund	August 21-September 7
Labor Day holiday. College closed.	September 4
Last day to drop a class with a tuition refund or change to audit	September 7
Professional development days for faculty. No classes for students.	October 9-10
Last day to withdraw without grade penalty	October 31
No classes. College offices close at noon	November 22
Thanksgiving holiday. College closed.	November 23-24
No classes. College offices closed.	November 25-26
Final exam week	December 11-17
Final Exam	December 13
Final exams end	December 11

Course Content

(visit http://www.nvcc.edu/academic/coursecont/summaries/MTH173.pdf for details)

Course Description

MTH 173– Calculus I introduces the basic concepts of differential and integral calculus: limit, derivative, differential, antiderivative, and definite integral. Presents analytic geometry. Designed for mathematical, physical, and engineering science programs.

Course Purpose

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This course is primarily for the student in mathematics, engineering, sciences, and in other areas requiring strong mathematical backgrounds. The general purpose is to give the student a basic understanding of the concepts of differential and integral calculus and to prepare the student for the second semester of calculus.

Prerequisites

Competency as demonstrated through the placement test, or MTH 166, or MTH 164.

Course Objectives

After completion this course, you should be able to:

- Define a function, the limit of a function at a point, continuity at a point and differentiability at a point
- State and show uses of the mean value theorem
- Compute the derivatives of polynomials, rational functions, and composite algebraic functions, and trigonometric functions, natural logarithmic and exponential functions
- Differentiate implicitly
- Apply the techniques of differential calculus to the problem of curve sketching
- Apply differentiating techniques to find velocity and acceleration and to solve related rate and maximum/minimum problems
- Define the anti-derivative of a function and define the Riemann integral
- Interpret the relationship between antidifferentiation and differentiation
- State and apply the fundamental theorem of calculus
- State the important properties of the integral
- Solve problems involving antiderivatives and areas
- State and use the mean value theorem for integrals
- Use approximation techniques in computing the definite integral
- Obtain competency in the use of a graphing utility and CAS in the topics below
- Obtain a balanced understanding of all of the concepts graphically, numerically, and symbolically

Major Topics

A. Optional Review of Precalculus Introductory Topics

1. Mathematical Induction
2. Completeness Axiom
3. Inequalities
4. Linear Equations
5. Absolute Values
6. Circles and Parabolas
7. Functions
    a. Definition
    b. Domain and Range
    c. Operations (sum, difference, product, quotient, composition, and the concept of an inverse function)
    d. Examples and classifications of important functions such as polynomials, rational function, composite algebraic functions, trigonometric functions, natural logarithmic and exponential functions.

B. Limits of Functions

1. Definition
2. Properties of Limits
3. One Sided limits

C. Continuity
1. Definition
2. Theorems of Continuity
3. Types of Discontinuity

D. Derivatives
1. Slope of tangent lines, instantaneous rates of change and instantaneous velocity.
2. Definition of derivative at a point.
3. Computation of derivative using definition and rules for differentiating sums, differences, products, quotients and compositions of functions, including polynomials, rational functions, composite algebraic functions, and trigonometric functions, natural logarithmic and exponential functions.
4. Relationship between continuity and differentiability
5. Higher order derivatives
6. Implicit Differentiation
7. Mean Value Theorem

E. Differentials
1. Definition
2. Linear approximations

F. Applications of Differentiation
1. Related rate problems
2. Increasing and decreasing functions
3. Velocity and acceleration
4. Extrema: first and second derivative tests
5. Maximum/minimum problems
6. Concavity and points of inflection
7. Asymptotes
8. Curve sketching

G. Anti-differentiation
1. Definition
2. Find anti-derivatives of polynomials, some trigonometric functions, and certain exponential functions
3. Substitution

H. Riemann Integral
1. Definition
2. Properties
3. Mean Value Theorem for Integrals
4. Fundamental Theorem of Calculus

I. Application of Integrals
1. Area
2. Numerical Integration
a. Trapezoidal Method
b. Simpson's Rule

Extra Topics (optional)
A. Newton's Method for approximating roots.
B. Applications to economics

Textbook

In this course, we will be using materials available in Open Educational Resources (OER).

The textbook is Calculus Volume 1 by Gilbert Strang, Edwin Herman., et al. This is an OpenStax resource that can be found at https://openstax.org/details/calculus-volume-1.

Syllabus

WebAssign
WebAssign is a valuable tool for study and review. I highly recommend to use it. There will be an extra credit of 10% for each homework assignment if you do it by using WebAssign.
If you want to purchase access to WebAssign, you need the Class Key: **nvcc 9140 8626**

The price of WebAssign instant Access for OpenStax Calculus for one semester is $33.95
The price of WebAssign instant Access for OpenStax Calculus for several semesters is $51.90

Calculator
This course requires a graphing device TI-83 or better; TI-89 is strongly recommended.

Grading Policy

Grading Categories

- Homework and class assignments - 10%
- Quizzes - 15%
- Exams - 45 %
- Final Exam - 30 %

Course Grade
The course grade will be a letter grade:

A - 90%-100%
B - 80%-89.9%
C - 70%-79.9%
D - 60%-69.9%
F - below 60%

No audits are given in this class. **The last day to withdraw with refund is September, 7**. **The last day to withdraw without grade penalty is October 31**. You are responsible for doing all paperwork before these last dates.

Attendance:
It is very important to attend this class. If you miss no more than two classes, your lowest grade on homework, quizzes, or tests will be dropped. My experience shows that regular attendance and active class participation, in most cases, results in a passing grade.

Grading Assignments

Homework: Problems will be assigned for every section covered in class. The homework is due the following week of class. Do not forget to put your name, the text book section, pages and problem numbers.
Note: *If your average grade on the tests is more than 70%, you will get a 5% extra credit for your homework.*
Quizzes: We will have quizzes on most weeks. You can make up one quiz.

Tests: There will be four tests, one hour each.
The tentative schedule for the tests is this.

Test 1 **September**
Test 2 **October**
Test 3 **November**
Test 4 **December**

Please let me know in advance if you are not able to attend the class on any of these days. You may make up a test within two weeks after the test. It is your responsibility to schedule the make-up test with me.

Final Exam

The final exam is scheduled for **Monday, December 11, 2017 from 5:30 PM to 7:10PM**. The exam will be comprehensive and cover all course material.
All students are expected to attend the final exam. There is no make-up for the final.

Exam/Test Policy
You may not share calculators during exams/tests or quizzes. You may not use cell phones as calculators during exams and quizzes.
Cheating – receiving or giving unauthorized help- will result in a score of 0 on that exam.

Classroom Behavior
You should silence cellular phones. No texting during class time.

Inclement Weather or Other Emergency Events
If the college is closed, a text alert will be sent to cell phones registered on NOVA Alert, a notice will be posted on the College's website www.nvcc.edu/emergency. You can also call the College Call Center at 703.323.3000.

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, who is located in Bisdorf (AA) 229, phone (703) 933-1840. More information may be found at the following website:
http://www.nvcc.edu/current-students/disability-services/index.html

Note: The syllabus is subject to change.

Course Outline

(Subject to change at any time)

Week	Date	Section	Assignment (due the following week on Monday)
1	08/21	Course Syllabus *2.1 A Preview of Calculus 1.1 Review of Functions 1.2 Basic Classes of Functions 1.3 Trigonometric	1.1.: 7,11,18,25,34,36,40,48,55 1.2:59,65,75,83,92,97,102,902,905 908,909,912 1.3: 122,126,132,139,149,155,161,171,904

		Functions	
1	08/23	2.1 A Preview of Calculus 2.2 The Limit of a Function 2.3 The Limit Laws	2.1: 1, 10,16,22,26,901 2.2: 30,35,38,47,55,77, 901 2.3: 85,93,110,115,119,123,128
2	08/28	2.4 Continuity 2.5 Infinite Limits 2.5 The precise Definition of a Limit	
2	08/30	3.1 Defining the Derivative 3.2 The Derivative as a Function	
3	**09/04**	**No classes**	
3	09/06	**Review** **TEST 1**	
4	09/11	3.3 Differentiation Rules 3.4 Derivative as Rates of Change	
4	09/13	3.4 Derivatives of Trigonometric Functions 3.6 The Chain Rule	
5	09/11	1.4 Inverse Functions 3.7 Derivatives of Inverse Functions	
5	09/18	3.8 Implicit Differentiation	
6	09/20	4.1 Related Rates 4.2 Linear Approximations and Differentials	
6	09/25	4.3 Maxima and Minima	
7	09/27	4.4 The Mean Value Theorem	
7	10/02	**Review** **TEST 2**	
8	10/04	4.5 Derivatives and the Shape of a Graph	
8	10/09	**Professional Development for Faculty**	
9	10/11	4.5 Derivatives and the Shape of a Graph 4.6 Limits at Infinity	
9	10/16	4.6 Curve Sketching	
10	10/18	4.7 Applied Optimization Problems	
10	10/23	4.8 L'Hospital Rule *4.9 Newton's Method	

11	10/25	4.10 Antiderivatives	
11	10/30	**Review** **TEST 3**	
12	11/01	5.1 Approximating Areas	
12	11/06	5.2 The Definite Integral	
13	11/08	5.3 The Fundamental Theorem of Calculus	
13	11/13	5.4 Integration Formulas	
14	11/15	5.5 Substitution	
14	11/20	5.5 Substitution 5.6 Integrals Involving Exponential and Logarithmic Function	
15	11/22	**No Classes**	
15	11/27	5.7 Integrals Involving Inverse Trigonometric Functions	
16	11/29	**Review** **TEST 4**	
16	12/04	Review	
17	12/06	Review	
17	**12/11**	**Final Exam**	**5:30 PM – 7:10 PM**