Northern Virginia Community College

MTH 173-201A (11413) **CALCULUS with Analytic Geometry I (5 CR.)** **Summer 2015**

Syllabus

Instructor: Dr. Alexander Krantsberg
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Office: Bisdorf, Room AA 352

Class Time: Mondays, Tuesdays, Wednesdays, and Thursdays 9:00 AM - 12:00 PM.
Classroom: Bisdorf , AA 456

Office hours: Tuesday and Thursday 12:00 PM – 1:30 PM

Important Dates

June 29	**Classes begin**
July 6	**Last day to drop a class with a tuition refund**
July 24	**Last day to withdraw without grade penalty**
August 3-8	**Last week of classes**
August 6	**Final Exam**

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

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

Satisfactory completion of MTH 166, MTH 164 or two units of algebra, one of geometry, one-half unit each of trigonometry and precalculus.

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 (marg

Textbook

Calculus: Early Transcendental Functions, 6th Edition, by Ron Larson and Bruce Edwards; ISBN: 978-1-285-77477-0

This textbook will be used in Calculus II MTH 174 and Vector Calculus MTH 277 as well.

There are three options for you to choose.
1. Rent a used or new textbook ($135-$195).
2. Buy a used or new textbook ($225-$300).
3. Buy a textbook with WebAssign Access Code ($336).
4. Buy a WebAssign Access code with an online version of the textbook (eBook) – (under $80 for one term and about $110 for the life of the edition).

WebAssign

WebAssign is a valuable tool for study and review. It is not required, but I highly recommend it. There will be an extra credit of 10% for homework if you do it by using WebAssign.

If you purchased access to WebAssign, you need the Class Key: **nvcc 9032 4886**

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 July 6, 2015**. **The last day to withdraw without grade penalty is July 24, 2015**. 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 quizz.

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

Test 1 July 6
Test 2 July 13
Test 3 July 20
Test 4 July 30

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 **Thursday, August 6, 2015 from 9:00 AM to 11:30AM**. 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.

Syllabus

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	06/29	1.1 Graphs and Models 1.2 Linear Models and Rates of Change 1.3 Functions and Their Graphs	pp.8-9: 1,4,9,15, 20,32,52,60,65 pp.16-18: 3,10,36,42,82 pp.27-29: 1,4,7,16,29,43,65
1	06/30	2.1 A preview of Calculus 2.2 Finding Limits Graphically and Numerically 2.3 Evaluating Limits Analytically	pp. 67: 6,9 pp.75-78: 3,15, 20, 25,28,31,35,41,64 pp.87-89: 1,7,11,28,31,38,47,55,58,65,75,79
1	07/1	2.4 Continuity and One-Sided Limits 2.5 Infinite Limits	pp.99-102: 2,5,14,15, 19,22,30,55,58,75,99 pp.108-109: 1,3,7,13,23,26,37,47,52,64
1	07/2	3.1 The Derivative and the Tangent Line Problem 3.2 Basic Differentiation Rules and Rate of Change	pp.123-126: 1,7,12,17,21,29,33,49,54,68,77,89
2	**07/6**	3.2 Basic Differentiation Rules and Rate of Change 3.3 Product and Quotient Rules and Higher-Order Derivatives **TEST 1**	pp.135-138 :2,9,13,25,35,43,64,69 pp.146-148:1,7,12,20,23,27,33,37,46,51,63,70,87,96,103,122,123

2	07/7	3.4 The Chain Rule 3.5 Implicit Differentiation	pp.160-164: 2,6,10,19,27,41,51,58,60,73,84,109,117,167, pp. 171-173:2,7,16,32,37,47
2	07/8	1.5 Inverse Functions 3.6 Derivatives of Inverse Functions 3.7Related Rates	pp.44-47:10,13,31,43,65,71,93,95,101,108 pp. 178-180: 1,13,20,31,49,63 pp.186-189:1,7,15,21
2	07/9	*3.8 Newton's Method 4.1 Extrema on an Interval	pp.207-209:2,5,8,11,15,25,27,40,49,69,72
3	**07/13**	4.2 Rolle's Theorem and the Mean Value Theorem **TEST 2**	pp.214-216: 2,5,9,14,26,29,38,46,67
3	07/14	4.3 Increasing and Decreasing Functions and the First Derivative Test	pp.223-226: 1,5,14,20,25,33,43,57,77,103
3	07/15	4.4 Concavity and the Second Derivative Test	pp.232-234: 12,19, 24,30,31,39,42,54,81,77
3	07/16	4.5Limits at Infinity 4.6 Curve Sketching	pp.242-245: 2,3,7,12,15,19,23,25,35,40,49,51,71,95,97
4	07/20	4.6 Curve Sketching **TEST 3**	pp.253-255: 2,9,11,15,23,27,33,41
4	07/21	4.7 Optimization Problems 4.8 The Differential of a Function	pp.262-265:2,6,11,20,22,25,40,45 pp.272-273:1,4,7,11,15,19,24,32,39,43
4	07/22	5.1 Antiderivatives and Indefinite Integration	pp.287-289:3,5,6,7,9,14,19,23,24,29,25,35,37,41,51,53,60,63
4	07/23	5.2 Area	pp.299-301:1,3,7,8,11,15,16,17,21,22,25,35,39,41,45,57,63
5	07/27	5.3Riemann Sums and Definite Integrals	pp.309-312:1,3,6,9,12,17,19,24,27,31,33,41,42,47,63
5	07/28	5.4 The Fundamental Theorem of Calculus	pp.324-327: 1,2,3,5,11,13,15,18,21,23,27,29,33,37,40,41,43,45,48,49,55,59,66,72,89,93, 103
5	07/29	5.5 Integration by Substitution 5.6 Numerical Integration	pp.337-340: 2,3,5,17,19,25,28,35,37,40,45,48,52,56,61,69,73,79,86,87,90,91 pp.346-347:1,15
5	**07/30**	5.7 The Natural Logarithmic Function **TEST 4**	pp. 354-356:4,6,9,11,13,17,21,25,27,31,33,41,47,56,73
6	08/3	Review	
6	08/4	Review	
6	08/5	Review	
6	**08/6**	**Final Exam**	**9:00 AM – 11:30 AM**