

# New York University

## MATH-UA 123 - 001: Calculus 3

### Fall 2021

Professor: Samuel Potter (sfp@cims.nyu.edu)

*Please don't hesitate to contact me if you have any questions or concerns.*

## Course Description

Calculus III is a third-semester calculus course for students who have a good knowledge of differential and integral calculus for functions of a single variable. In this course, we will figure out how to generalize these concepts for functions of two, three, or potentially many variables. Why study multivariable calculus? Simply put, in the real world any given quantity depends on many other ones. By the end of the course, you will understand how to mathematically describe such systems.

Some key topics, roughly in order of their appearance in the course, include:

- the geometry of three-dimensional space and vectors,
- vector functions or space curves, and their calculus,
- functions of several variables, partial derivatives, and gradients,
- multiple integration, including different coordinate systems,
- vector fields, their derivatives (divergence and curl) and their integrals (line and surface integrals), and
- the fundamental theorems of vector calculus (Green's, Gauss', and Stokes').

The material we take up in this course has applications in physics, chemistry, biology, environmental science, astronomy, economics, statistics, and just about everything else. We want you to leave the course not only with computational ability, but with the ability to use these notions in their natural scientific contexts, and with an appreciation of their mathematical beauty and power.

By the end of the course, students will be able to:

- investigate higher-dimensional geometry using the concept of a vector,
- understand the concept of a function when extended to multiple inputs and outputs,
- learn about and compute limits in higher dimensions,
- learn about and compute derivatives in higher dimensions (partial, directional, total, gradient, divergence, curl, etc.),

- learn about and compute integrals in higher dimensions (area, volume, path, surface, flux, and the like),
- and communicate mathematically, including understanding, making, and critiquing mathematical arguments.

## Course Logistics

All course policies, grades, announcements, documents, and this syllabus can be found on the course Brightspace site at <http://brighstpace.nyu.edu>.

## Class meetings

Classes will meet in-person at their regularly scheduled times in their regularly scheduled classroom. Exams and quizzes will be proctored in-person during class time.

## Textbooks and Course Materials

- Cengage WebAssign subscription for *Essential Calculus: Early Transcendentals, 2ed* by James Stewart (details, access, and login via Brightspace)

## Course Topics and Calendar

Below is a list of topics that will be covered in the course and their approximate date.

Week	Date	Section	Topics
1			
2	9/8/21	10.1-2	Coordinate systems and vectors
3	9/13/21	10.3-4	Dot products and cross products
	9/15/21	10.5	Equations for lines and planes
4	9/20/21	10.6	Cylinders and quadric surfaces
	9/22/21	10.7-8	Space curves and arc length
5	9/27/21	10.9	Velocity and acceleration
	9/29/21	11.1-2	Functions of several variables; continuity
6	10/4/21	11.3	Partial derivatives

	10/6/21	11.4	Tangent planes and linear approximations
7	10/12/21	11.5	The chain rule
	10/13/21		<b>EXAM 1</b>
8	10/18/21	11.6	Directional derivatives and the gradient
	10/20/21	11.7	Maximum and minimum values
9	10/25/21	11.8	Lagrange multipliers
	10/27/21	12.1-2	Double integrals
10	11/1/21	12.3	Integrals in polar coordinates
	11/3/21	12.5	Triple integrals
11	11/8/21	12.6-7	Cylindrical and spherical coordinates
	11/10/21	13.1-2	Vector fields and line integrals
12	11/15/21	13.3	The fundamental theorem of line integrals
	11/17/21		<b>EXAM 2</b>
13	11/22/21	13.4	Green's theorem
	11/24/21	13.5	Curl and divergence
14	11/29/21	13.6	Parametric surfaces and their areas
	12/01/21	13.7	Surface integrals
15	12/6/21	13.8	Stokes' theorem
	12/8/21	13.9	The divergence theorem
16	12/13/21		Review
	12/17/21	10:00-11:50AM	<b>FINAL EXAM</b>

# Course Work

Students in this course will:

- do online homework (via WebAssign)
- do problem sets (submit via Gradescope)
- take quizzes
- take 2 midterm exams, and
- take a cumulative final exam.

## Online HW (via WebAssign)

WebAssign is an online homework platform and can be accessed via Brightspace. WebAssign requires a subscription. The due dates of each assignment will be indicated within WebAssign. *The purpose of WebAssign HW is to allow students to get immediate feedback on their work. WebAssign also allows students to see more questions they don't get to see in class or during exams.*

## Problem Sets

Problem sets will be posted on Brightspace and/or Gradescope, and the due dates of each assignment will be indicated. These problems typically involve critical thinking, and full solutions must be presented. *The purpose of the problem sets is to challenge students into applying fundamental concepts learned in class into new or unique situations they may not have seen before. In addition, the problem sets require students to present worked solutions in a clear, logical manner.*

## Quizzes

Quizzes are formative assessments to test students' understanding of the material. *The purpose of quizzes is to ensure students are understanding the material currently being covered and discussed in class and to ensure they are involved throughout the semester. In addition, the quizzes will allow students to experience an exam-like environment.*

## Midterm and Final Exams

Midterm exams will be given during the semester. The midterms will be summative assessments and comprehensive of the course material taught until that point. A cumulative final exam will be given at the end of the semester that tests students' understanding of all the course material. *The purpose of the exams is to test students' understanding of the course material in a summative, holistic approach. Some problems may involve multiple concepts.*

# Course Grading

## Grade Categories and Weights

Your exams, homework, and quizzes will be graded according to the following grade weights:

- Online HW, each equally weighted (5% total)
- Problem Sets, each equally weighted (10% total)
- Quizzes, each equally weighted (20% total)
- Midterm Exams (35%)
- Final Exam (30%)

Each category is weighted in accordance with their purposes in the course. Doing well on the exams, although weighted highly, does not make up for poor performance on quizzes or homework, as each category serves a specific purpose in the course.

## Grading Scale and Letter Grades

Course letter grades will be assigned at the end of the semester. For each course work category (and subcategory), you will be given a percentage calculated from the ratio of total points earned and total points possible. Then, we will calculate the weighted average of these percentages, and assign a course letter graded according to the table below:

<b>Letter Grade</b>	<b>Weighted average (wa) of the percent of points earned in each category</b>
A	$93\% \leq wa \leq 100\%$
A-	$90\% \leq wa < 93\%$
B+	$87\% \leq wa < 90\%$
B	$83\% \leq wa < 87\%$
B-	$80\% \leq wa < 83\%$
C+	$75\% \leq wa < 80\%$
C	$65\% \leq wa < 75\%$

D	$50\% \leq wa < 65\%$
F	$wa < 50\%$

## Course Policies

### Missed Exams

If a student misses a midterm exam due to an illness, emergency, or university sanctioned event, the student's final exam will carry the weight of the missed exam, if approved by the professor. In some cases, it may be possible to schedule a makeup. If a student sits for an exam, the grade they receive will be calculated in their course grade. A student cannot miss more than one midterm exam. If a student misses the final exam, or two or more midterm exams, due to a documented illness, documented emergency, or a university sanctioned event, the student may request a course grade of "incomplete."

### Missed Quizzes

If a student misses a quiz or participation assignment, it cannot be made up, unless there are extenuating circumstances approved by the professor. These circumstances typically include university sanctioned events (e.g. athletics), religious observation, or an illness. Missing a quiz for work or personal reasons will not be made up.

**2 quizzes will be dropped from your course grade calculation at the end of the semester.**

### Late or Missed Homework

Late homework will not be accepted, unless there are extenuating circumstances approved by the professor.

**5 WebAssign HW assignments will be dropped from your course grade calculation.**

**1 problem set HW will be dropped from your course grade calculation.**

### Grade Appeals

All grade appeals for graded work must be submitted via email to the professor within 5 calendar days the grade was released to the student.

## Academic Integrity

Guidelines regarding cheating and plagiarism are laid out in the College of Arts and Sciences guidelines available online at <http://cas.nyu.edu/page/academicintegrity>, and they will be adhered to strictly. Collaboration is permitted, in fact encouraged, for home and class assignments; however, all submitted assignments must be written up independently and represent the student's own work and understanding.

## Student Accessibility

New York University is committed to providing equal educational opportunity and participation for students with disabilities or accessibility concerns. It is the University's policy that no qualified student with a disability or accessibility concern be excluded from participating in any University program or activity, denied the benefits of any University program or activity, or otherwise subjected to discrimination with regard to any University program or activity. The Henry and Lucy Moses Center for Students Accessibility (CSA) determines qualified disability status and assists students in obtaining appropriate accommodations and services. CSA operates according to an Independent Living Philosophy and strives in its policies and practices to empower each student to become as independent as possible. Their services are designed to encourage independence, backed by a strong system of support. Any student who needs a reasonable accommodation based on a qualified disability or accessibility issue is required to register with the CSA for assistance.