

# **MATH 120 Calculus of Functions of Several Variables**

**Course Number and Title:** MATH 120 Calculus of Functions of Several Variables

**METU Credit & ECTS Credit:** (4-2)5 & 7.5

**Catalogue Description:** Sequences and infinite series. Power series. Taylor series. Vectors and analytic geometry in 3-space. Functions of several variables: limits, continuity, partial derivatives. Chain rule. Directional derivatives. Tangent planes and linear approximations. Extreme values. Lagrange multipliers. Double integrals. Double integrals in polar coordinates. General change of variables in double integrals. Surface parametrization and surface area in double integrals. Triple integrals in Cartesian, cylindrical and spherical coordinates. Parametrization of space curves. Line integrals. Path independence. Green's theorem in the plane.

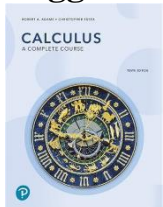
**Course Objectives:** The sequence Math 119-120 is the Standard complete introduction to the concepts and methods of calculus. It is taken by all engineering students. The emphasis is on concepts, solving problems, theory and proofs. All sections are given a uniform midterm and a final exam. Students will develop their reading, writing and questioning skills in Mathematics.

**Prerequisites:** Math 119

**Course Coordinator:** Dr. Muhiddin Uğuz

<b>Midterm I</b>	<b>November 15, 2025, 16:30</b>	<b>30%</b>
<b>Midterm II</b>	<b>December 20, 2025, 16:30</b>	<b>30%</b>
<b>Final</b>	<b>January 08, 2026, 16:30</b>	<b>40%</b>

## **Suggested textbook:**



Robert A. Adams, Christopher Essex  
CALCULUS  
A Complete Course Calculus. 10th (or 9th) Edition.  
ISBN 978 0-13-573258-8

**Reference Books:** Calculus James Stewart, Fifth Edition (or any newer)

**Current Semester Course Home Page:** <http://www.ma120.math.metu.edu.tr/>

**Contact:** [wwwma120@metu.edu.tr](mailto:wwwma120@metu.edu.tr)

Week	Dates	Syllabus (Math 120) 2025-1	Suggested Problem List
1	September 29-October 03	<b>Ch. 9: Sequences, Series, and Power Series</b> 9.1 Sequences and Convergence	<a href="#">Worksheet on Sequences and Series</a> 9.1: 6,8,10,17,18,19,24,26,29,31,35
2	October 06-10	9.2 Infinite Series 9.3 Convergence Tests for Positive Series	9.2: 4,6,8,10,12,14,26,27,28,29,30,31 9.3: 4,6,12,16,18,20,24,26,38,42
3	October 13-17	9.4 Absolute and Conditional Convergence 9.5 Power Series	9.4: 2,4,8,10,16,20,24,27 9.5: 4,8,10,13,14,17,18,22,26,28,30
4	October 20-24	9.5 Power Series 9.6 Taylor and Maclaurin Series 9.7 Applications of Taylor and Maclaurin Series	9.5: 4,8,10,13,14,17,18,22,26,28,30 9.6: 6,8,12,18,22,26,34,35,40 9.7: 6,7,12,16,18,24
5	October 27-31 <small>Republic Holiday (28 October Tuesday is a half day holiday and 29 October Wednesday is a full day holiday)</small>	<b>Ch. 10: Vectors and Coordinate Geometry in 3-Space</b> 10.1 Analytic Geometry in Three Dimensions 10.2 Vectors 10.3 The Cross Product in 3-Space 10.4 Planes and Lines	10.1: 6,19,22,27,32,36,40 10.2: 4,13,16,18,22,26,31 10.3: 3,5,14,15,17,20,23 10.4: 3,6,9,18,23,26,28,29
6	November 03-07	10.4 Planes and Lines 10.5 Quadric Surfaces <b>Ch. 12: Partial Differentiation</b> 12.1 Functions of Several Variables 12.2 Limits and Continuity	10.4: 3,6,9,18,23,26,28,29 10.5: 3,5,8,10,12,15,17,20,21  12.1: 4,5,8,12,13,14,20,24 12.2: 2,6,8,10,12,14,18
7	November 10-14 <small>Commemoration of Atatürk (Monday)</small>	12.2 Limits and Continuity 12.3 Partial Derivatives 12.4 Higher-Order Derivatives <b>Midterm I (November 15, 2025)</b>	12.2: 2,6,8,10,12,14,18 12.3: 4,5,6,11,12,16,17,21,24,28,31,36,39 12.4: 4,10,16
8	November 17-21	12.5 The Chain Rule 12.6 Linear Approximations 12.7 Gradients and Directional Derivatives 12.8 Implicit Functions ( <i>"Systems of Equations" is <u>not</u> included</i> ) <b>Ch. 13: Applications of Partial Derivatives</b> 13.1 Extreme Values	12.5: 4,8,16,18,29,30 12.6: 4,6,10,16 12.7: 4,8,10,17,18,19,22,26,36 12.8: 2,5,6,11  13.1: 1,3,6,7,9,11,17,19,24,26
9	November 24-28	13.2 Extreme Values of Functions Defined on Restricted Domains 13.3 Lagrange Multipliers <b>Ch. 14: Multiple Integration</b> 14.1 Double Integrals	13.2: 3,5,7,8,9,11,17 13.3: 1,3,5,7,9,11,19,21,22  14.1: 5,13,15,18,19
10	December 01-05	14.2 Iteration of Double Integrals in Cartesian Coordinates 14.4 Double Integrals in Polar Coordinates 14.5 Triple Integrals	14.2: 1-27 odd 14.4: 1-25 odd 14.5: 2,4,6,7,9,10,14,15
11	December 08-12	14.6 Change of Variables in Triple Integrals <b>Ch. 11: Vector Functions and Curves</b> 11.1 Vector Functions of One Variable 11.3 Curves and Parametrizations <b>Ch. 15: Vector Fields</b> 15.1 Vector and Scalar Fields	14.6: 2,3,4,6,10,12,16  11.1: 8,10,16,18 11.3: 1,2,3,4,6,8,17,18,24  15.1: 2,3,6
12	December 15-19	16.1 Gradient, Divergence, and Curl 15.2 Conservative Fields 15.3 Line Integrals <b>Midterm II (December 20, 2025)</b>	16.1: 3,4 15.2: 2,6,9 15.3: 2,6,8,13,14
13	December 22-26	15.3 Line Integrals 15.4 Line Integrals of Vector Fields	15.3: 2,6,8,13,14 15.4: 4,6,8,9,13,22
14	December 29-January 02 <small>New Year's Day (Thursday)</small>	<b>Ch. 16: Vector Calculus</b> 16.3 Green's Theorem in the Plane	16.3: 1,2,3,4,5,6,7,9
		<b>F i n a l E x a m ( J a n 0 8 , 2 0 2 6 )</b>	

### Class Attendance

Attendance during lectures and recitations will not be taken. However, you are strongly suggested to attend the lectures and recitations.

### Make up for Exams and Assignments

You can have at most one make-up exam. In order to be able to take the make-up exam, you must present a reasonable excuse (such as a medical report or an academic leave) when requested.

### Eligibility to take the Final Exam and NA Grade

If your two midterm scores (each one out of 100 points) add up to less than 20 points (out of 200 points in total), then you cannot take the Final Exam and will receive an NA grade from the course. If you did not attend the Final Exam and if you do not have the right to take make-up exam for Final, you will receive an NA grade.

### **More clearly**

**(A)** Before the final exam, students will be categorized in the following way:

1)  $M1 + M2 \geq 20$

2)  $M1 + M2 < 20$ ,

for which M1 is the Midterm 1 score **out of 100**, and M2 is the Midterm 2 score **out of 100**.

- Students in group 1 will be able to take the final exam.
- Students in group 2 will **NOT** be able to take the final exam. They will get an automatic NA grade.

### **Examples:**

**a)** Student A attends to Midterm 1 and his score is 20 out of 100. He/she does not take Midterm 2 being on leave for academic/medical reasons. Since  $M1+M2 = 20 \geq 20$ , He/she is eligible for the final exam. If he/she submits relevant documents, it is also possible to take make-up exam which is given after the final. *No problem at all.*

**b)** Student B does not attend to Midterm 1 because of their illness. He/she attends to Midterm 2 and get 18 points out of 100. Since  $M1+M2 = 18 < 20$ , he/she won't be able to take final exam and get **NA** grade. **It should be in mind that in this example, taking make-up for Midterm is not possible even if he/she has an appropriate official document (academic/medical report etc.).**

**(B)** According to the university's rules and regulations governing undergraduate studies (Article 24),

*"...The grade NA is designated due to one of the conditions below. The grade NA is processed as FF in the calculation of the Grade Point Average.*

*1) Not fulfilling the attendance requirements for the theoretical and practical course hours as indicated in the course schedule.*

*2) Not qualifying to take the final exam due to failure in fulfilling the provisions regarding course practices.*

*3) Having taken none of the mid-term and final examinations.*

*..."*

**Information for Students with Disabilities**

Students who experience difficulties due to their disabilities and wish to obtain academic adjustments and/or auxiliary aids must contact ODTU Disability Support Office and/or course instructor and the advisor of students with disabilities at academic departments (for the list: <http://engelsiz.metu.edu.tr/en/advisor-students-disabilities>) as soon as possible. For detailed information, please visit the website of Disability Support Office: <https://engelsiz.metu.edu.tr/en/>

**Academic Honesty**

The METU Honor Code is as follows: "Every member of METU community adopts the following honor code as one of the core principles of academic life and strives to develop an academic environment where continuous adherence to this code is promoted. The members of the METU community are reliable, responsible and honorable people who embrace only the success and recognition they deserve, and act with integrity in their use, evaluation and presentation of facts, data and documents."