Math 302
Calculus III

Text: *Multivariable Calculus*, 6th edition, Hughes-Hallett, Gleason, McKallum, et al., Wiley, 2013

Prerequisites: Math 301 with a grade of C or better, or transfer credit in an equivalent course from another university.

Calculus is a branch of mathematics which for over three centuries has served as the basis for the analysis of continuous change. Applying calculus to real-life problems in science, engineering, or other fields requires both an understanding of how the mathematics can be used to model problems and the capability of performing the calculations and computations necessary to obtain solutions. Most calculus courses emphasize the computational aspects of the subject, presenting calculus as a collection of formulas and algorithms to be learned and then applied to problems which have been carefully contrived to work out nicely. However, recent years have seen the development of powerful graphing calculators and computer software packages which can perform all of the numerical and symbolic calculations needed in calculus and can also produce a variety of graphics which help in visualizing complex relations. The availability of these calculators and computer systems has led to a national movement to change the focus of calculus courses from computational techniques to the study of fundamental concepts and significant applications.

Our new textbook concentrates on the most important topics of calculus (limits, derivatives, integrals, etc.), but with emphasis on the graphical and numerical representation of functions and other relations as well as the traditional use of symbolic formulas. Students frequently complain that they have difficulty reading a traditional calculus book, and that they therefore count on the instructor to explain the material through lectures. Their use of the book is thus limited to looking at examples of solved problems and then working on similar homework exercises. In contrast, the materials in our new text are meant to be read thoroughly and carefully. The writing is plain and straight-forward. While the text does contain some routine "drill" exercises, the authors have included several other types of in-depth problems designed to develop conceptual understanding. A number of the problems are intended to be discussed by students working together in small groups. This new approach to calculus is enhanced by the availability of new technology, which can heighten our understanding of mathematical relationships. In this course, the graphing calculator will be the standard tool for visualization and numerical computation.

This syllabus is an outline for 40 class periods of Calculus III. The additional class periods will be devoted to review and assessment.

Lesson	Section and Topic	Assignment
1	12.1 Functions of two variables	1, 2, 3, 7, 9, 11, 13, 14, 15, 21, 22, 23, 27, 28, 30, 31, 32, 33, 35, 37
	Strengthen your Understanding	39, 40, 41, 44, 45, 49 - 54
2	12.2 Graphs and Surfaces	2 - 17, 19, 20, 31
	Strengthen your Understanding	32, 33, 40 - 43
3	12.3 Contour Diagrams	1, 2, 4, 6, 8, 10, 11, 13, 14, 16, 21, 26, 27, 30
	Strengthen your Understanding	43, 44, 47, 52 - 55
4	12.4 Linear Functions	2, 4, 6 - 13, 18, 19, 20, 22, 26, 32
	Strengthen your Understanding	33, 37, 38, 39, 40
5	12.5 Functions of three variables	1, 2, 4, 5, 8, 9, 11 - 15, 16, 18, 19, 28, 30, 33, 36
	Strengthen your Understanding	38, 39, 40, 45, 46, 49
6	12.6 Limits and Continuity	2, 5, 7, 11, 13, 14, 15, 16, 18, 20
7	13.1 Displacement Vectors	1, 2, 4, 6, 10, 14, 16, 22, 25, 26, 28, 29, 30, 33, 36, 38, 41, 42
	Strengthen your Understanding	44, 45, 52, 53, 54, 56, 59
8	13.2 Vectors in General	6, 8, 10, 11, 12, 14 - 17, 20, 21, 22
9	13.3 The Dot Product	4, 6, 8 - 11, 13 - 16, 20, 22, 25, 27, 29, 32, 38, 40, 45, 46, 55, 57, 62
	Strengthen your Understanding	73, 76 - 82
10	13.4 The Cross Product	2, 6, 11, 15, 16, 20, 22, 28, 29, 32, 35, 42, 50, 51, 52
	Strengthen your Understanding	55, 58, 59, 60, 63
11	14.1 The Partial Derivative	2, 3, 4, 6, 7, 11, 15, 17, 18, 21, 23, 25
	Strengthen your Understanding	36, 37, 40, 42, 44, 49
12	14.2 Computing Partial Derivatives	1, 2, 3, 5, 6, 13, 18, 19, 23, 24, 25, 35, 36, 38, 40, 43, 47, 49, 50
	Strengthen your Understanding	52, 58, 59, 61, 63, 65
13	14.3 The Differential	1, 2, 5, 8, 11, 14, 15, 18, 20, 22, 23, 25, 26, 32, 33, 36, 38, 41, 42

Lesson	Section and Topic	Assignment
14	14.4 The Gradient	3, 7, 9, 10, 12, 15, 19, 22, 23, 24, 29, 30, 33, 37, 38, 42, 46, 48, 49, 51, 54, 62, 64, 65, 67, 78
	Strengthen your Understanding	96, 97, 99, 101, 102, 103, 105, 107, 108
15	14.5 The Gradient	1, 2, 5, 7, 8, 17, 18, 20, 23, 28, 29, 33, 36, 40, 42, 45, 46, 51, 55, 57, 64
	Strengthen your Understanding	70, 75, 77
16	14.6 The Chain Rule	2, 4, 7, 10, 15, 17, 20, 25, 29, 33
17	14.7 Second-Order Partial Derivatives	3, 6, 7, 8, 11, 12, 15, 19, 22, 24, 28, 30, 38, 40, 41
18	14.8 Differentiability	
19	15.1 Critical Points	3, 4, 5, 9, 10, 11, 16, 19, 21, 26, 28, 32, 38, 39
	Strengthen your Understanding	41, 42, 46, 47, 50
20	15.2 Optimization	2, 5, 7, 9, 12, 13, 14, 16, 18, 19, 20, 31
	Strengthen your Understanding	39, 40, 41, 42, 43
21	15.3 Lagrange Multipliers	2, 5, 6, 9, 12, 14, 17, 18, 19, 24, 31, 39
22	16.1 The Definite Integral	5, 6, 8, 10, 12, 15
	Strengthen your Understanding	22, 23, 24, 26
23	16.2 Iterated Integrals	2, 4, 5, 8, 9, 11, 14, 16, 18, 20, 22, 23, 26, 33, 34, 35, 40, 43, 46, 50
	Strengthen your Understanding	63, 64, 68, 69, 75
24	16.3 Triple Integrals	1, 3, 5, 8, 11, 12, 14, 15, 17, 19, 20, 22, 26, 28, 29, 34, 35, 36, 43, 46, 48, 49, 57, 60, 61, 62, 65, 68
	Strengthen your Understanding	74, 75, 76, 79, 80, 83
25	16.4 Polar Coordinates	2, 3, 7 - 10, 12, 15, 18, 20, 22, 25, 26, 27, 29, 33
26	16.5 Cylindrical & Spherical Coord.	1, 2, 4, 5, 7, 11 - 15, 21, 22, 23, 29, 33, 34, 37, 38, 39, 48, 51, 63, 64
27	17.1 Parameterized Curves	1, 3, 4, 7, 11, 15, 19, 23, 26, 30, 33, 37, 41, 43, 44, 45, 50, 51, 82
	Strengthen your Understanding	88, 91, 92
28	17.2 Motion, Velocity, & Accel.	1, 2, 5, 7, 10, 11, 15, 16, 21, 27, 29, 33, 40, 51
29	17.3 Vector Fields	8, 11, 12, 15, 16, 19, 20, 31
30	18.1 Line Integrals	1, 3, 4, 6, 11, 14, 15, 17, 21, 22, 23, 25, 27 - 29, 37, 39, 41, 45, 48
	Strengthen your Understanding	58, 59, 62 - 65, 67
31	18.2 Computing Line Integrals	2, 4, 7, 8, 10, 14, 15, 20, 22, 25, 27, 29, 31, 32, 35, 41
	Strengthen your Understanding	42, 43, 46
32	18.3 Path-Independent Vector Fields	2, 3, 5, 8, 10, 14, 15, 18, 19, 21, 23, 24, 27, 30, 32, 33, 36, 39, 41, 45, 47, 48, 51
	Strengthen your Understanding	64, 66, 69, 70, 75 - 79, 81 - 83
33	18.4 Green's Theorem	2, 6, 8 - 10, 12, 14, 15, 18, 20, 21, 28, 29, 38
	Strengthen your Understanding	45, 46, 50
34	19.1 A Flux Integral	1, 2, 3, 8, 9, 12, 14, 17, 18, 23, 27, 32, 34, 37, 40, 43, 56, 59
	Strengthen your Understanding	72, 75, 79
35	19.2 Flux Integrals	1, 3, 5, 7, 9, 11, 13, 17, 21, 31, 34, 36, 39, 43, 46, 49, 53, 56
	Strengthen your Understanding	63, 65
36	19.3 Divergence	3, 4, 7, 8, 10, 12, 13, 15, 18, 21, 27, 36, 40
	Strengthen your Understanding	51 - 60, 64
37	19.4 The Divergence Theorem	1, 3, 4, 7, 9, 11, 14, 15, 17, 18, 20, 25, 23, 26, 28, 29
	Strengthen your Understanding	47, 48, 49
38	20.1 The Curl of a Vector Field	1, 3, 6, 8, 9, 10, 12, 17, 21, 26, 27
	Strengthen your Understanding	39, 40, 41, 42, 43, 44, 47
39	20.2 Stokes' Theorem	3, 4, 5, 6, 8, 9, 11, 13, 17, 18, 21, 27, 28, 30
40	20.3 The Three Fundamental Theorems	1, 3, 4, 6, 8, 10, 12, 18, 21, 22, 23, 25

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