Math 200-01/04, Multivariable Calculus, Spring 2017
MWF 8:15-9:20 OSS 227 (Section 01), 12:15-1:20 OSS 127 (Section 04)

Instructor: Amy DeCelles

> Email: `adecelles@stthomas.edu`
> Webpage: http://personal.stthomas.edu/dece4515/
> Office: OSS 203
> Office phone: 2-5695
> Tentative office hours: MWF 11:00-12:00, Tu 2-3, Th 4-5, and by appointment

Course Prerequisites: Successful completion (C- or better) of Math 114, or its equivalent.

Credits and Workload Expectations: 4 credits: 8-10 hours per week outside the classroom.

Course Materials and Resourses:

- Textbook: *Calculus: Single and Multivariable*, 6th ed., Hughes-Hallett, McCallum, et. al.

- *Mathematica* Software: https://www.stthomas.edu/irt/students/desktopsupport/software/

- Math Resource Center (MaRC, OSS 235) : free drop-in peer tutoring, group study areas, solution manuals, WebAssign tutorials, *Mathematica* help, . . .

Course Objectives:

- Gaining factual knowledge, terminology and methods (representations of multivariable functions, vectors and vector operations, partial differentiation, multivariate integration, vector fields, line integrals, flux integrals, etc.)

- Learning fundamental principles, generalizations, and theories (linearity and local linearity in several variables, Green's Theorem, Divergence Theorem, Stokes' Theorem, etc.)

- Learning to apply course material (optimization of multivariate functions, volumes of solids, physical applications of multivariate and vector calculus)

- Developing skill in expressing myself orally or in writing (clear written solutions and oral presentations of problems)

Assignments: To prepare for class you will be assigned reading, along with **reading questions** and **discussion problems** related to the reading. After we have covered a topic in class, you will be assigned a **problem set**, consisting of the discussion problems and some additional problems related to the topic. For each topic, you will also write up one **quality solution**. Occasionally, in-class participation or presentations may be graded.

Collaboration and consultation: I encourage you, when working on homework, to collaborate with fellow students, to reread the textbook, and to ask the professor or the MaRC tutors for help. You are also free to consult other textbooks or online resources for general information on the topic. However, you may not consult any worked solution to an assigned homework problem. This includes but is not limited to: the student solution manual, the instructor solution manual,

WileyPlus, other students' written homework, and any online solution. If in doubt about the acceptability of a certain kind of collaboration or consultation, ask the professor.

Late Work: Late work is typically not accepted. The lowest three scores in each assignment category will be dropped at the end of the semester. Extensions may be granted if requested before the due date, and work may certainly be submitted before the due date, if arrangements have been made with the professor in advance. If there is a serious, unforeseeable reason for missing more than three days of class, it is the student's responsibility to contact the professor as soon as possible and to make appointments with the professor and with Academic Counseling upon returning to classes to make a plan for making up missed work.

Missed Exams: Make-up midterm exams may be given to students with legitimate excuses such as serious illness, university sponsored events, etc., as long as the make-up exam can be taken within a reasonable time frame. If it is not possible to schedule a make-up exam within a reasonable time frame, the grade for the midterm may be prorated from the final exam. Written documentation may be required. Rescheduling the final is not possible except under very extreme circumstances.

Incompletes: Grades of I are normally not given in this course. However, they may be granted due to extenuating circumstances especially if (i) the majority of the course work has been completed at a level of C or better and (ii) the student demonstrates the ability to complete the remaining coursework outside of the classroom. In such cases, a well-documented petition should be submitted to the professor before the last day of classes. Please see the university policies on withdrawals and incomplete grades.

Final Course Grade: The overall score for this course will be computed as outlined below. Final letter grades will be assigned based on the overall score, with the two major components, quality solutions and exams also being considered separately. In particular, the final letter grade will not be higher than one letter grade above the level of the work on written solutions or the work on exams. Exceptional performance on the final may also be taken into account.

- Preparation (5%): reading questions (RQ, 2.5%), discussion preparation (D, 2.5%)

- Mastery Homework (30%): problems sets (P, 5%), quality solutions (QS, 25%)

- Quizzes (10%): six ten-minute quizzes throughout the semester

- Midterm Exams (25%): tentatively Mon Mar 6 and Fri Apr 21

- Final Exam (25%): cumulative; **1:30-3:30 pm Thurs May 18**, location TBA

- Best Exam (5%): at the end of the semester the score for the best exam will contribute an extra 5% towards the overall score

Disability Accommodations: Academic accommodations will be provided for qualified students with documented disabilities including but not limited to mental health diagnoses, learning disabilities, Attention Deficit Disorder, chronic medical conditions, visual, mobility, and hearing disabilities. Students are invited to contact the Disability Resources office about accommodations early in the semester. Appointments can be made by calling 651-962-6315 or in person in Murray Herrick, room 110. For further information, you can locate the Disability Resources office on the web at http://www.stthomas.edu/enhancementprog/.

Math 200, S2017, Detailed Schedule

Mon	Wed	Fri
Jan 30, 2017	Feb 1, 2017	Feb 3, 2017
Intro to course Due today: RQ 12.1 Next class: RQ 12.2-3, D 12.1	Functions of two variables (12.1) Due today: RQ 12.2-3, D 12.1 Next class: RQ 12.4, D 12.2-3, P&QS 12.1	Graphs, surfaces, contour diagrams (12.2, 12.3) Due today: RQ 12.4, D 12.2-3, P&QS 12.1 Next class: RQ 12.5-6, D 12.4, P&QS 12.2-3
Feb 6, 2017	Feb 8, 2017	Feb 10, 2017
Linear functions (12.4) **Quiz 1** Due today: RQ 12.5-6, D 12.4, P&QS 12.2-3 Next class: RQ 13.1-2, D 12.5-6, P&QS 12.4	Functions of 3 vars (12.5) Limits and continuity (12.6) Due today: RQ 13.1-2, D 12.5-6, P&QS 12.4 Next class: RQ 13.3, D 13.1-2, P&QS 12.5-6	Displacement vectors, vectors in general (13.1, 13.2) Due today: RQ 13.3, D 13.1-2, P&QS 12.5-6 Next class: RQ 13.4, D 13.3, P&QS 13.1-2
Feb 13, 2017	Feb 15, 2017	Feb 17, 2017
The dot product (13.3) Due today: RQ 13.4, D 13.3, P&QS 13.1-2 Next class: RQ 14.1-2, D 13.4, P&QS 13.3	The cross product (13.4) Due today: RQ 14.1-2, D 13.4, P&QS 13.3 Next class: RQ 14.3, D 14.1-2, P&QS 13.4	The partial derivative (14.1, 14.2) Due today: RQ 14.3, D 14.1-2, P&QS 13.4 Next class: RQ 14.4, D 14.3, P&QS 14.1-2
Feb 20, 2017	Feb 22, 2017	Feb 24, 2017
Local linearity, the differential (14.3) **Quiz 2** Due today: RQ 14.4, D 14.3, P&QS 14.1-2 Next class: RQ 14.5, D 14.4, P&PS 14.3	Gradients, the directional derivative in the plane (14.4) Due today: RQ 14.5, D 14.4, P&QS 14.3 Next class: RQ 14.6, D 14.5, P&QS 14.4	Gradients, the directional derivative in 3-space (14.5) Due today: RQ 14.6, D 14.5, P&QS 14.4 Next class: RQ 14.7, D 14.6, P&QS 14.5
Feb 27, 2017	Mar 1, 2017	Mar 3, 2017
The chain rule (14.6) Due today: RQ 14.7, D 14.6, P&QS 14.5 Next class: RQ 15.1, D 14.7, P&QS 14.6	Second-order partial derivs (14.7) Due today: RQ 15.1, D 14.7, P&QS 14.6 Next class: D Rev, P&QS 14.7	Review (12.1-14.7) Due today: D Rev, P&QS 14.7 Next class: Study for exam
Mar 6, 2017	Mar 8, 2017	Mar 10, 2017
Exam 1 Next class: RQ 15.2, D 15.1	Critical points: local extrema and saddle points (15.1) Due today: RQ 15.2, D 15.1 Next class: RQ 15.3, D 15.2, P&QS 15.1	Optimization (15.2) Due today: RQ 15.3, D 15.2, P&QS 15.1 Next class: RQ 8.3, D 15.3, P&QS 15.2
Mar 13, 2017	Mar 15, 2017	Mar 17, 2017
Constrained optimization: Lagrange multipliers (15.3) Due today: RQ 8.3, D 15.3, P&QS 15.2 Next class: RQ 16.1-2, D 8.3, P&QS 15.3	Polar coordinates (8.3) **Quiz 3** Due today: RQ 16.1-2, D 8.3, P&QS 15.3 Next class: RQ 16.3, D 16.1-1, P&QS 8.3	Double integrals (16.1, 16.2) Due today: RQ 16.3, D 16.1-2, P&QS 8.3 Next class: RQ 16.4, D 16.3, P&QS 16.1-2
Mar 20, 2017	Mar 22, 2017	Mar 24, 2017
Spring Break	Spring Break	Spring Break
Mar 27, 2017	Mar 29, 2017	Mar 31, 2017
Triple Integrals (16.3) Due today: RQ 16.4, D 16.3, P&QS 16.1-2 Next class: RQ 16.5, D 16.4, P&QS 16.3	Double integrals in polar coordinates (16.4) Due today: RQ 16.5, D 16.4, P&QS 16.3 Next class: RQ 21.2, D 16.5, P&QS 16.4	Integrals in cylindrical and spherical coordinates (16.5) **Quiz 4** Due today: RQ 21.2, D 16.5, P&QS 16.4 Next class: RQ 17.1-2, D 21.2, P&QS 16.5
Apr 3, 2017	Apr 5, 2017	Apr 7, 2017
Change of variables and the Jacobian (21.2) Due today: RQ 17.1, D 21.2, P&QS 16.5 Next class: RQ 17.3, D 17.1, P&QS 21.2	Parametrized curves (17.1) Due today: RQ 21.1, D 17.1, P&QS 21.2 Next class: RQ 17.3, D 20.1, P&QS 17.1	Parametrized surfaces (21.1) Due today: RQ 17.3, D 21.1, P&QS 17.1 Next class: RQ 18.1-2, D 17.3, P&QS 21.1
Apr 10, 2017	Apr 12, 2017	Apr 14, 2017
Vector fields (17.3) **Quiz 5** Due today: RQ 18.1-2, D 17.3, P&QS 21.1 Next class: RQ 18.3, D 18.1-2, P&QS 17.3	Line integrals (18.1, 18.2) Due today: RQ 18.3, D 18.1-2, P&QS 17.3 Next class: D Rev, P&QS 18.1-2	Good Friday
Apr 17, 2017	Apr 19, 2017	Apr 21, 2017
Easter Monday	Review (15.1-17.1, 17.3 21.1-2) Due today: D Rev, P&QS 18.1-2 Next class: Study for exam	**Exam 2** Next class: RQ 18.4, D 18.3
Apr 24, 2017	Apr 26, 2017	Apr 28, 2017
Gradient fields, path-independent fields (18.3) Due today: RQ 18.4, D 18.3, P&QS 18.1-2 Next class: RQ 19.1, D 18.4, P&QS 18.3	Path-dependent fields, Green's theorem (18.4) Due today: RQ 19.1, D 18.4, P&QS 18.3 Next class: RQ 19.2, D 19.1, P&QS 18.4	The idea of a flux integral (19.1) Due today: RQ 19.2, D 19.1, P&QS 18.4 Next class: RQ 19.3-4, D 19.2, P&QS 19.1
May 1, 2017	May 3, 2017	May 5, 2017
Special flux integrals (19.2) Due today: RQ 21.3, D 19.2, P&QS 19.1 Next class: RQ 19.3-4, D 21.3, P&QS 19.2	Flux integrals over parametrized surfaces (21.3) **Quiz 6** Due today: RQ 19.3-4, D 21.3, P&QS 19.2 Next class: RQ 20.1, D 19.3-4, P&QS 21.3	Divergence of a vector field and the divergence theorem (19.3, 19.4) Due today: RQ 20.1, D 19.3-4, P&QS 19.2/21.3 Next class: RQ 20.2, D 20.1, P&QS 19.3-4
May 8, 2017	May 10, 2017	May 12, 2017
Curl of a vector field (20.1) Due today: RQ 20.2, D 20.1, P&QS 19.3-4 Next class: RQ 20.3, D 20.2, P&QS 20.1	Stokes' theorem (20.2) Due today: RQ 20.3, D 20.2, P&QS 20.1 Next class: D 20.3, P&QS 20.2	Three fundamental theorems (20.3) Due today: D 20.3, P&QS 20.2 Due 11:59 tonight: P&QS 20.3

Math 200, Spring 2016, Assignments from Textbook

Section	Discussion	Additional Problems	QS
12.1	2, 4, 11, 12, 21, 22, 23, 25	13, 14, 27, 28, 31	24
12.2	4, 5, 6, 9, 10, 16, 17, 18	2, 3, 7, 8, 11, 31	18
12.3	5, 7, 16, 25	6, 8, 9, 17, 28	
12.4	3, 6, 7, 8, 9, 10, 11, 15, 25, 26	4, 5, 12, 14, 18, 19, 20, 27, 28	16
12.5	1, 8, 11, 12, 13, 20, 37	2, 9, 10, 21, 35	36
12.6	1, 2, 5, 19	3, 4, 6, 18	
13.1	3, 5, 7, 8, 10, 26, 34, 37	4, 6, 20-24, 33	32
13.2	8, 9, 11, 16	12, 13, 24, 26	
13.3	10, 15, 19, 29, 32, 42, 49, 53	11, 13, 27, 30, 40, 43, 48, 59	36
13.4	20, 21, 22, 29, 31, 32	25, 26, 27, 30, 35	34
14.1	4, 9, 10, 11, 12, 13, 21, 25	6, 8, 24	
14.2	5, 10, 12, 13, 23, 45	8, 15, 18, 24, 25, 49	44
14.3	3, 6, 11, 17, 22, 30	2, 5, 16, 25, 35	18
14.4	4, 9, 18, 23, 34, 35, 38, 51, 82	7, 10, 25, 36, 37, 39, 40, 84	50
14.5	10, 12, 17, 20, 21, 24, 25, 54	3, 5, 8, 18, 22, 26, 39	48
14.6	4, 5, 9, 12, 17, 18	2, 6, 10, 13, 20	14
14.7	4, 5, 15, 21, 22, 37, 39, 41	6, 7, 14, 20, 27, 40, 44, 51	18
15.1	9, 12, 13, 33a	11, 16, 32a	10
15.2	5, 7, 9, 10, 14, 19	6, 8, 11, 17	20
15.3	5, 13, 18, 19	3, 8, 14, 32	12
8.3	9, 14, 17	15, 18, 19	16
16.1	3	4	
16.2	13, 14, 28, 29, 33, 35, 38	9, 30, 34, 39, 41	42
16.3	28, 31, 45, 65	43, 48, 66	50
16.4	16, 19, 27, 30	17, 20, 29	28
16.5	3, 6, 40, 49, 54, 57	2, 5, 48, 58	52
21.2	3, 14, 16, 18	11, 12, 13, 15	10
17.1	18, 26, 27, 29, 39, 57, 61	29, 30, 35, 38, 56, 58, 71	20
21.1	7, 8, 10, 11, 13, 15, 20, 21, 33	12, 14, 19, 27a, 34, 35	16
17.3	7, 10, 20, 26, 37	8, 9, 27, 29	28
18.1	37	38, 42	
18.2	7, 18, 22, 28, 36	8, 14, 29	12
18.3	7, 8, 14, 17, 54	15, 19, 24, 48	30
18.4	1, 5, 12, 22, 31	13, 23	20
19.1	12, 15, 41, 43, 49, 61ac	25, 28, 44, 45, 47, 62ac	48
19.2	9, 17, 20, 25, 27, 37	12, 18, 19, 26, 46, 50	38
21.3	2, 5, 8, 9	4, 6, 7	12
19.3	4, 10, 17	8, 18, 27	
19.4	1, 5, 6, 9, 16	3, 15, 17, 31a	18
20.1	6, 7, 8, 16, 19, 21	18, 23, 28	22
20.2	2, 3, 12, 28	13, 15, 16, 27	14
20.3	4, 13, 14, 17, 21	5, 10, 18, 24	12