James Madison University
Department of Mathematics and Statistics
Calculus III – Math 237, Summer 2012

MTuWTh 1:00-3:45 Roop G010 (4 weeks) Godwin 336 (2weeks)

Overview: Math 237 is a 4 credit class that extends the concepts of calculus to vector and multivariate functions, after covering vector geometry. Calculus is essentially a rigorous formulation of rates of change, and as such forms the basis of much in the sciences and engineering.

Goals: To develop an understanding and ability to work with:
1. Polar coordinates.
2. Cartesian, cylindrical, and spherical coordinates in three dimensions.
3. Vectors in two and three dimensions including dot products, cross products, and the calculus of vectors.
4. Equations of lines, planes, cylinders, and quadric surfaces in three dimensions.
5. Differentiation of functions of several variables and applications including tangent planes and maxima and minima problems.
6. Double and triple integrals and their applications including areas, volumes, and centers of mass.
7. Classical theorems of vector analysis, including line integrals, Fundamental Theorem of Line Integrals, Green's Theorem, Stokes' Theorem, and the Divergence Theorem.

Instructor: Dr. Stephen Lucas.
To contact me: In Person: Roop 341. Please make an appointment for meetings outside of class times. Phone: 568-5104, Email: lucassk@jmu.edu

Pre-requisite: Completion of Math 236 with a grad of C- or higher, or consent of the instructor.

Textbook: Draft Manuscript of Calculus With Functions III by Peter Kohn and Laura Taalman, 2012. We will attempt to cover the entire text.

Calculators: A graphing calculator could be useful for this course. Calculators with symbolic manipulation abilities, such as the TI-89 or TI-92, are banned from tests and the final exam, and as such I do not recommend using them during the semester.

Homework, Exams and Grading: Homework problems will be assigned in each class period. The following class period will have time for discussion and questions on the homework. All homework is to be handed in at the beginning of the next class period. A roll of dice will determine which ones will be graded. There will probably be two projects, which will be more in-depth than homework questions. There will be two midterm tests and a final. These will be predominantly made up of homework problems. Your grade will be determined as follows: Homework 20%, Projects: 10%, Midterm tests 15% (each), Final Exam 40%. Final grades will be somewhat related to A≥85, B≥65, C≥50, but may vary depending on the class average and natural divisions between raw scores. Plus/minus grades may also be provided. Borderline cases will be decided based upon class participation, effort, and performance throughout the semester.

Attendance: Attendance is not mandatory. However, past experience suggests there is an extremely strong correlation between attendance and success, particularly during the summer. If you cannot make a class and hand in homework, please give to a classmate to give to me on the day. If you miss handing in homework or a test without previously getting my permission, you will receive a zero for that homework or test. If there is a medical emergency and you cannot inform me beforehand, let me know as soon as possible. Any potential clashes should be brought to my attention as soon as possible.

Getting Help: If you need help, ask! The worst thing you can do in a math course is let things slide, since material at the beginning of the course is built upon later. It is best to contact me via email. If you wish to see me outside of class, please make an appointment beforehand. I can't guarantee that I will be available if you come and knock on my door at a random time. You can also get help from the Math and Science Learning Center (Roop 200), which is a resource specifically designed for helping students in courses like this one.

While new material will be presented every day, there will always be time for questions. I also encourage you to ask questions during class. If there is something you don't understand, it is quite likely others are having similar difficulties.

Honor Policy: Students are presumed to have the highest standards of integrity. To reinforce these standards, the JMU Honor Code will be strictly enforced.

Some random advice:
- Read each section of the book either before or after the corresponding lecture, but always before you attempt the homework questions.

- Don't just copy the answers in the back of the book. Include appropriate amounts of working. True/false questions ask for reasons, so don't just write "true" or "false". Graded homework will involve partial credit, and the majority of the marks will be for the working.
- Don't fall behind. If something doesn't make sense, ask me about it in class. It's quite likely that several other students don't understand what is causing you problems, so I can immediately try and explain it in another way. Lectures are not there for me to drone on endlessly; they are there for me to help you learn.
- If you get a bad grade in a homework assignment or test, don't panic. Instead, get help, and take the time to work out what you missed.
- Math is about understanding, not memorizing. If you are memorizing a lot of things you may be studying the wrong way.
- Working in groups is encouraged, since talking over problems is one of the best ways to learn. I have no problem with you working together on the homework problems. However, *simply copying someone else's homework solutions and handing it in is plagiarism*. Write out your own version.

Proposed Math 237 Syllabus
Summer 2012

Date	Section	Homework Problems
1a-M 5/14	10.1 Cartesian Vectors 10.2 Vectors 1 10.2 Vectors 2	
1b-Tu 5/15	10.3 Dot Product 1 10.3 Dot Product 2	
1c-W 5/16	10.4 Cross Product 1 10.4 Cross Product 2 9.1 Parametric Equations	
1d-Th 5/17	10.5 Lines in 3D 10.6 Planes 11.1 Vector Functions	
2a-M 5/21	11.2 Vector Calculus 11.3 Unit Tangent & Normal 11.4 Arc Length & Curvature	
2b-Tu 5/22	11.4 Curvature 11.5 Motion	

2c-W 5/23	Review	
2d-Th 5/24	Test I	
3a-M 5/28	Memorial Day, No class	
3b-Tu 5/29	9.2 Polar Coordinates 12.1 Functions of Multiple Variables	
3c-W 5/30	12.2 Limits & Continuity 12.3 Partial Derivatives	
3d-Th 6/31	12.4 Directional Derivatives 12.5 Chain Rule & Gradient	
4a-M 6/4	12.6 Extreme Values 12.7 Lagrange Multipliers	
4b-Tu 6/5	12.7 Lagrange Multipliers 13.1 Double Integrals, Rectangles	
4c-W 6/6	Review	
4d-Th 6/7	Test II	
5a-M 6/11	13.2 Double Integrals, Regions 13.3 Double Integrals, Polar Coords 13.4 Applications Double Integrals	
5b-Tu 6/12	13.4 Applications Double Integrals 13.5 Triple Integrals	
5c-W 6/13	13.5 Triple Integrals 13.6 Cylindrical & Spherical Coords 13.7 Jacobians & Change of Vars	
5d-Th 6/14	13.7 Jacobians & Change of Vars 14.1 Vectors Fields 14.2 Line Integrals	
6a-M 6/18	14.2 Line Integrals 14.3 Surface Integrals	
6b-Tu 6/19	14.4 Green's Theorem 14.5 Stokes' Theorem 14.6 Divergence Theorem	
6c-W 6/20	Review	
6d-Th 6/21	Final	

Proposed Math 237 Syllabus and Homework Problems

Spring 20??

Date	Section	Homework Problems
1: 1-M 1/10	Introduction 10.1 – Cartesian Coordinates	A.1: 1, convert 0.7111…, 0.246246… to fractions
2: 1-W 1/12	10.2 – Vectors 1	A.1: 2,3,5,9,11,13,26
3: 1-Th 1/13	10.2 – Vectors 2	A.3: 1,5,9,16,49,21,23,27,29
4: 1-F 1/14	10.3 – Dot Product 1	1.1: 1,3,5,11,12,23,25,27,43,47,50,51
2-M 1/17	MLK Day, No Class	
5: 2-W 1/19	10.3 – Dot Product 2	1.2: 1,2,3,5,7,9,11,12,8
6: 2-Th 1/20	10.4 – Cross Product 1	1.2: 17,18,21,24,29,31,49,55,56,57,58
7: 2-F 1/21	10.4 – Cross Product 2	1.3: 1,3,5,7,8,37,38,43,51
8: 3-M 1/24	9.1 – Parametric Equations	1.4: 1,7,11,13,15
9: 3-W 1/26	10.5 – Lines in 3D	1.5: 1-6,11,13,15,25,26,29,33, 35,49
10: 3-Th 1/27	10.6 – Planes	
11: 3-F 1/28	11.1 – Vector Functions 11.2 – Calculus of Vectors	2.1: 1,2,5,9,10 2.2: 1,3,5,9
12: 4-M 1/31	11.3 – Unit Tangent & Normal	2.2: 11,12,25,26,29,34,47,50,71
13: 4-W 2/2	11.4 – Arc Length	2.4: 21,22,23,26 2.3: 1,2,7,9
14: 4-Th 2/3	11.4 – Curvature	2.3: 37,45,57,39,44
15: 4-F 2/4	11.5 – Motion	2.4: 1,3,7,9,19
5-M 2/7	Catch-Up	2.4: 37,39,55,57,61,6 2.5: 1,3,5,21
5-W 2/9	Review	
5-Th 2/10	Midterm I	
16: 5-F 2/11	9.2 – Polar Coordinates	2.6: 5,6,7,8,9,10,35,45,49,62
17: 6-M 2/14	12.1 – Functions of Mult Var.	2.7: 5,7,8 3.1: 1,3,4,17,31,35
18: 6-W 2/16	12.2 – Limits & Continuity	3.1: 37,38,39,40 3.2: 1,3,53
19: 6-Th 2/17	12.3 – Partial Derivatives	3.2: 7,13,17,21,25,40,45,47,61(a)
20: 6-F 2/18	12.4 – Direction Deriv & Diff	3.3: 3,9,15 3.4: 1,3,5,19,49,50(a)
21: 7-M 2/21	12.5 – Chain Rule	3.5: 9,13,17,20,32,41,65,81,85,105
22: 7-W 2/23	12.5 – Gradient	3.6: 3,7,11,23,27,40,49
23: 7-Th 2/24	12.6 – Extreme Values 1	3.7: 7,11,19,21,27,32,41,51,54,99
24: 7-F 2/25	12.6 – Extreme Values 2	3.9: 6,9,13,14,19,20

Date	Section	Homework Problems
25: 8-M 2/28	12.7 – Lagrange Multipliers	3.10: 1,3,5,17,19,23,41,49
26: 8-W 3/2	13.1 – Double Int Rectangle	4.1: 1-6,15,17,19,47,64,69
27: 8-Th 3/3	13.2 – Double Int Regions 1	4.2: 1,4,9,15,23,51
28: 8-F 3/4	13.2 – Double Int Regions 2	4.3: 1,5,7,15,31,36,56
3/7-3/11 Spring Break		
29: 9-M 3/14	13.3 – Double Int Polar	4.4: 1,3,70,75,76,11,21
30: 9-W 3/16	13.4 – Double Int Applic.	4.5: 3,5,11,13,33
31: 9-Th 3/17	13.5 – Triple Integrals 1	
32: 9-F 3/18	13.5 – Triple Integrals 2	4.7: 1,5,10,18
10-M 3/21	Catch-Up	
10-W 3/23	Review	
10-Th 3/24	Midterm II	
33: 10-F 3/25	13.6 – Cylind. & Spherical	
34: 11-M 3/28	13.7 – Jacobians	4.8: 1,6,11,19,41,51,71,78 5.1: 1,3,7,9
35: 11-W 3/30	13.7 – Jacobians 14.1 – Vector Fields	5.2: 1,3,7,17,19,25
36: 11-Th 3/31	14.2 – Line Integrals 1	No homework
37: 11-F 4/1	14.2 – Line Integrals 2	5.3: 1,3
38: 12-M 4/4	14.3 – Surface Integrals 1	5.3: 9,11,13,65,66,71
39: 12-W 4/6	14.3 – Surface Integrals 2	5.3: 15,19,21,27,33
40: 12-Th 4/7	14.4 – Green's Theorem 1	5.4: 35,37,43,47
41: 12-F 4/8	14.4 – Green's Theorem 2	5.4: 5,9,21,25
42: 13-M 4/11	14.5 – Stokes' Theorem	5.4: 51,53,57
43: 13-W 4/13	14.6 – Divergence Theorem	5.5: 1,4,7,12,13,27,40,67
44: 13-Th 4/14	9.5 – Conic Sections	5.6: 1,7,11,29,114
45: 13-F 4/15	9.5 – Conic Sections	5.7: None
14-M 4/18	Catch-Up	
14-W 4/20	Review	
14-Th 4/21	Midterm III	
47: 14-F 4/22	No Class	
48: 15-M 4/25	Return Midterm III	
49: 15-W 4/27	Review	
50: 15-Th 4/28	Review	
51: 15-F 4/29	Review	