MAT 203: Calculus III with applications

Fall 2010

Schedules			
LEC 1	M-F 12:50pm-2:10pm	Hvy Engr Lab 201	Fabrizio Donzelli
R01	W 10:40am-11:35am	Physics P116	Ilya Elson
R02	Tu 11:20am-12:15pm	Chemistry 128	Andrew Stimpson
LEC 2	T-R 5:20 pm-6:40 pm	Harriman Hll 112	Marco Martens
R03	W 5:20 pm-6:15 pm	Physics P116	Ilya Elson
R04	M 5:20-6:15 pm	Harriman Hll 116	Andrew Stimpson

Contact Information		
Fabrizio Donzelli	Math Tower 3-102	fabrizio@math.sunysb.edu
Marco Martens	Math Tower 4-113	marco@math.sunysb.edu
Ilya Elson	Math Tower 3-122	ielson@math.sunysb.edu
Andrew Stimpson	Math Tower 3-101	stimpson@math.sunysb.edu

Text

Larson, Edwards, *Multivariable Calculus*, 9th edition.

Course Content

Vector algebra in two and three dimensions, multivariate differential and integral calculus, optimization, vector calculus including the theorems of Green, Gauss, and Stokes. Applications to engineering, physics, and all sciences.

Syllabus

If do not know how to solve a problem, please come to see us! For lectures schedule, homework, exam dates, please click on the following links:

Lecture 1: Monday and Friday

Lecture 2: Tuesday and Thursday

The homework are assigned during class, and posted on the web page. You will have about a week to

complete the homework assignment, which you will submit to your recitation teacher. Late homework will not be accepted. A collection of three problems per assignment will be graded every week, but you will not know which ones will be chosen. If do not know how to solve a problem, do not gamble by leaving it blank, please come to see us!

Preparation to TEST I

Click here for a list of suggested problems and other information about TEST I.

Preparation to TEST II

Click here for a list of suggested problems and other information about TEST II. (last update: October 23)

Preparation to Final Exam

Click here for a list of suggested problems and other information about the Final Exam. (last update: December 1)

Grading

The grading will be weighted as follows: homework 25%, midterm I 20%, midterm II 20%, final 35%. The grades are available on blackboard .

Office Hours

If you would like to meet on a different time, please email us for fixing an appointment.

Fabrizio Donzelli	Monday 4:00-6:00 pm, in 3-102; Monday 3:00-4:00 pm in MLC; or by appointment
Marco Martens	Tuesday and Thursday, 1:00-2:00 pm in 4-113; or by appointment
Ilya Elson	Wednesday, 4:00-5:00 pm in 3-122; Wednesday 12-2pm in MLC; or by appointment
Andrew Stimpson	Friday, 10:50-11:50 am in 3-101; Monday 3:00-5:00 pm in MLC; or by appointment

Examples

Click here for some examples

Stony Brook University Syllabus Statement

If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact Disability Support Services at (631) 632-6748 or http://studentaffairs.stonybrook.edu/dss/. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential. Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Disability Support Services. For procedures and information go to the following website: http://www.sunysb.edu/ehs/fire/disabilities.shtml.

Syllabus-LEC 1 Monday and Friday

Date	Sections	Homework	Due Date	Notes
Aug 30	11.1, 11.2	**11.1**:6,10,28,36,52,70 **11.2**:21,26,48,74,82,86	Wednesday, Sept 8	
Sept 03	11.3, 11.4	**11.3**:10,36,46,77,78 **11.4**:8,10,16,42,49,54,56	Wednesday, Sept 8	
Sept 06	-	-	-	No class-labor day
Sept 10	-	-	-	No class-Rosh Hashanah
Sept 13	11.5	**11.5**:10,12,16,31,40,48,56,64,100 ,102,108,124,130,131,132,133,134	Thursday, Sept 23	
Sept 17	11.6, 11.7	**11.6**:12,15,17,28,30,44,46,52,58	Thursday Sept 23	
Sept 20	11.7,12.1, 12.2	**11.7**:4,12,15,20,28,32,38,44,56 ,108,110,112,114 **12.1**:6,56,74,84,93-96 **12.2**:8,10,18,30,36,40,60,68	Thursday, Oct 7	
Sept 24	12.3, 12.4,12.5	**12.3**:22 **12.4**:10,14,22,27,28,70 **12.5**:14,19	Thursday, Oct 7	12.5: arc length only
Sept 27	Review for Test I	-	-	
Oct 1	**Test I**	-	-	**Test I syllabus: chapters 11 and 12**
Oct 4	13.1,13.2, 13.3	**13.1**:26,30,38,52,56 **13.2**:28,32 **13.3**:20, 28,36,76,86	Thursday, Oct 14	
Oct 8	13.4, 13.5, 13.613.7	**13.5**:10,16,26; **13.6**:28,30,38,52 **13.7**:40	Thursday, Oct 14	
Oct 11	13.7, 13.8	**15.2**: 2,4,6 **13.7**:24,52,60,62 **13.8**:6,10,14,46,48,50,54,61-64	Thursday, Oct 21	(15.2 is not a mistake)
Oct 15	13.8	See assignment from Oct 11		

Oct 18	14.1,14.2	**14.1**:(40),(46),(52),58,60,68,72 **14.2**:10,12,28,42,44,46,54,58	Thursday, Oct 28	number in parenthesis=suggested, won't be graded
Oct 22	14.3,14.5	**14.3**:14,30,36,48;**14.5**:2,12,18	Thursday, Oct 28	
Oct 25	14.6,14.7	**14.6**:14,(18),(28),(32); **14.7**: (10),14,16,(18),36,(50)	Thursday, Nov 11	number in parenthesis = suggestet only
Oct 29	14.8	**14.8**: 22,24	Thursday, Nov 11	number in parenthesis = suggested only
Nov 1	Review for Test II			
Nov 5	**Test II**			**Test II syllabus: chapter 13 and 14**
Nov 8	15.1,15.2	**15.1**:44,46,60,62,(90,92); **15.2**:26,38,46,(54)	Thursday, Nov 18	()=suggested
Nov 12	15.2,15.3	**15.3**:8,12,26,(43,46)	Thursday, Nov 18	()=suggested
Nov 15	15.3	**15.4**:(10,18),43,44	Tuesday, Nov 23	()=suggested
Nov 19	15.4	click here for the homework	Thursday, Nov 23	
Nov 22	15.5,15.6	**15.5**:22,30,44**15.6**:16,20,24,30	Thursday, Dec 2	
Nov 24	Examples			Correction day
Nov 26	-	-	-	No class-Thanksgiving
Nov 29	15.7,15.8	**15.7**:12,18,25-28; **15.8**:10,16,28	Suggested only	
Dec 3	15.7			
Dec 6	Review for final			
Dec 10	Review for final			Last day of class
Dec 15 **2:15-4:45pm** **Hvy Engr Lab 201**	**FINAL EXAM**			

Syllabus-LEC 2 Tuesday and Thursday

Date	Sections	Homework	Due Date	Notes
Aug 31	11.1, 11.2	**11.1**:6,10,28,36,52,70 **11.2**:21,26,48,74,82,86	Wednesday, Sept 8	
Sept 2	11.3, 11.4	**11.3**:10,36,46,77,78 **11.4**:8,10,16,42,49,54,56	Wednesday, Sept 8	
Sept 7	Examples			
Sept 9	No class			
Sept 14	11.5	**11.5**:10,12,16,31,40,48,56,64,100 ,102,108,124,130,131,132,133,134	Thursday, Sept 23	
Sept 16	11.6, 11.7	**11.6**:12,15,17,28,30,44,46,52,58	Thursday, Sept 23	
Sept 21	12.1, 12.2	**11.7**:4,12,15,20,28,32,38,44,56 ,108,110,112,114 **12.1**:6,56,74,84,93-96 **12.2**:8,10,18,30,36,40,60,68	Thursday, Oct 7	
Sept 23	12.3, 12.4, 12.5	**12.3**:22 **12.4**:10,14,22,27,28,70 **12.5**:14,19	Thursday, Oct 7	12.5: arc length only
Sept 28	Review for Test I	-	-	
Sept 30	**Test I (in class)**	-	-	**Test I syllabus: chapters 11 and 12**
Oct 5	13.1,13.2,13.3	**13.1**:26,30,38,52,56 **13.2**:28,32 **13.3**:20, 28,36,76,86	Thursday, Oct 14	
Oct 7	13.4,13.5,13.6,13.7	**13.5**:10,16,26; **13.6**:28,30,38,52 **13.7**:40	Thursay, Oct 14	
Oct 12	13.7, 13.8	**15.2**:2,4,6 **13.7**:24,52,60,62 **13.8**:6,10,14,46,48,50,54,61-64	Thursday, Oct 21	(15.2 is not a mistake)
Oct 14	13.8	See assignment from Oct 12		

Oct 19	14.1,14.2	**14.1**:(40),(46),(52),58,60,68,72 **14.2**:10,12,28,42,44,46,54,58	Thursday, Oct 28	number in parenthesis=suggested, won't be graded
Oct 21	14.3,14.5	**14.3**:14,30,36,48;**14.5**:2,12,18	Thursday, Oct 28	
Oct 26	14.6,14.7	**14.6**:14,(18),(28),(32); **14.7**: (10),14,16,(18),36,(50)	Thursday, Nov 11	number in parenthesis = suggested only
Oct 28	14.8	**14.8**: 22,24	Thursday, Nov 11	number in parenthesis = suggested only
Nov 2	Review for Test II			
Nov 4	**Test II (in class)**			**Test II syllabus: chapters 13 and 14**
Nov 9	15.1,15.2	**15.1**:44,46,60,62,(90,92); **15.2**:26,38,46,(54)	Thursday, Nov 18	()=suggested
Nov 11	15.2,15.3	**15.3**:8,12,26,(43,46)	Thursday, Nov 18	()=suggested
Nov 16	15.3	**15.4**:(10,18),43,44	Tuesday, Nov 23	()=suggested
Nov 18	15.4	click here for the homework	Thursday, Nov 23	
Nov 23	15.5,15.6	**15.5**:22,30,44**15.6**:16,20,24,30	Thursday, Dec 2	
Nov 25	-	-	-	No class: Thanksgiving
Nov 30	15.7,15.8	**15.7**:12,18,25-28; **15.8**:10,16,28	Suggested only	
Dec 2				
Dec 7	Review for final			
Dec 9	Review for final			Last day of class
Dec16 **2:15-4:45pm,** **Harriman Hll 112**	**FINAL EXAM**			

Preparation to TEST I

The exam will consist of 10 questions. You will be given one hour (from 12:50 to 1:50) to solve the test.

NO CALCULATORS ARE ALLOWED, neither any kind of notes. The problems will be similar to the ones contained in the following list.

Suggested problems

The exam will consist of 10 questions. The problem will be similar to the one contained in the following list.

Chapter 11, Section 11.5: 24, 63

Chapter 11, Review Exercises: 2,5,7,10,12,15,18,22,25,27,29,31,33, all from 43 to 54, 56,63

Chapter 12, Review Exercises: 16,19,35,41,65

Remarks

1. In class we have seen how to sketch many kinds of surfaces: on the test, we will ask you to sketch, given some geometric data, the following objects: **lines, planes, spheres, cylinders**.

2. You can forget about the symmetric equations of a line, but learn very well the parametric equations.

Preparation to TEST II

The exam will consist of about 10 questions. You will be given the full class time (from 12:50 to 2:10) to solve the test.

NO CALCULATORS ARE ALLOWED, neither any kind of notes. 90% of the exam will consists of questions similar to the ones given in the following list.

The remaning 10% will consists of more conceptual questions, always inspired by the problems listed below.

Suggested problems

13.1: 52,54; **13.2**: 83,84; **13.4**: 18;**13.5**:8,24; **13.6**: 54,56,58,74,77 ; **13.7**: from 41 to 46, from 51 to 57; **13.8**: from 21 to 28, from 45 to 54

14.1: from 33 to 46; **14.5**: from 1 to 18;**14.6**: from 17 to 20;**14.7**: 14, 16;**14.8**: 21,22,23,24.

Preparation to FINAL EXAM

The final exam will be structured as follows:

3 questions will be taken from Chapters 11 to 14;

3-4 questions will consists on computations involving the techniques and the theorems from Chapter 15;

3-4 questions will be of geometrical type (similar to the assigmnent posted online: click here).

NO CALCULATORS ARE ALLOWED, neither any kind of notes.

Suggested problems

12.3:1,2,7,21;**12.5**:3,6

13.6:1,2;**13.7**:31,33,40,43,55;**13.8**:7,9,25,49

14.2:10,11,54;**14.3**:30,35; **14.5**:17; **14.6**:23,25; **14.7**:15,19;

15: Problems 1-6 from the webpage **15.2**: 7, 13;
15.3:12,13,23,30;**15.4**:11,42,43;**15.5**:22,27;**15.6**:19,23,27;**15.7**: 7,17,19,20,25; **15.8**:7,13.

(1) *Completing the square.*

Given a polynomial of type
$x^2 + bx$, (for b=constant) we complete the square:

$$x^2 + bx = x^2 + bx + \frac{b^2}{4} - \frac{b^2}{4} = \left(x + \frac{b}{2}\right)^2 - \frac{b^2}{4}$$

Example: $x^2 + 12x = x^2 + 12x + 36 - 36 = (x+6)^2 - 36$

The next example illustrates an application of this simple trick.

(2) *Describe geometrically the region of space given by the equation*

$$x^2 + y^2 + z^2 - 4x + 12y - 16z = -4$$

We complete the square with respect to the x, y and z variables independently:

$$\begin{aligned} x^2 - 4x + y^2 + 12y + z^2 - 16z = \\ x^2 - 4x + 4 - 4 + y^2 + 12y + 36 - 36 + z^2 - 16z + 64 - 64 = \\ (x-2)^2 - 4 + (y+6)^2 - 36 + (z-8)^2 - 64 = -4 \end{aligned}$$

Now, move the constants to the left hand side of our equation:

$$(x-2)^2 + (y+6)^2 + (z-8)^2 = -4 + 4 + 36 + 64 = 100$$

The equation $(x-2)^2 + (y+6)^2 + (z-8)^2 = 100$ describes the spherical surface of center $(2, -6, 8)$ and radius 10.

How do we describe solid regions of the space?

(3) *Describe geometrically the region given by the inequality*

$$x^2 + y^2 + z^2 - 4x + 12y - 16z \geq -4$$

By completing the square as before, and then moving the constants to the left-had side as before, we obtain the inequality:

$$(x-2)^2 + (y+6)^2 + (z-8)^2 \geq 100$$

Taking the square root of it we get the inequality:

$$\sqrt{(x-2)^2 + (y+6)^2 + (z-8)^2} \geq 10$$

which is the set of all points (x, y, z) whose distance from $(2, -6, 8)$ is at least 10.

More geometrically: the spherical surface

$$(x-2)^2 + (y+6)^2 + (z-8)^2 = 100$$

obtained in the previous example, divides the space into two regions.

The inner region is the (open) ball of radius 10, given by the inequality

$$(x-2)^2 + (y+6)^2 + (z-8)^2 < 10.$$

The outer region is unbounded (you can go as far from the origin as you want by staying inside the region) and is given by

$$(x-2)^2 + (y+6)^2 + (z-8)^2 > 100$$

Our inequality $(x-2)^2 + (y+6)^2 + (z-8)^2 \geq 100$ includes the outer region(">" part) and the sherical surface ("=" part).

Remark. *In the one dimensional case (say, "x-only") , the analog of the open ball is an open interval (a, b),while the role of the boundary surface is played by the end points a and b.*

In two dimensions (the xy-plane) we have the open disk of radius R and center (x_0, y_0), given by the inequality

$$(x - x_0)^2 + (y - y_0)^2 < R^2$$

The boundary is then the circle of center (x_0, y_0) and radius R:

$$(x - x_0)^2 + (y - y_0)^2 = R^2$$