CALCULUS III

1. General Information

- Course: Calculus III-004, Fall 2010
- Prerequisites: Calculus I and suggested Calculus II
- Time: MW 4:10pm - 5:25pm
- Location: 207 Mathematics Building
- Instructor: Sabin Cautis
- Office: 600 Mathematics Building
- Office Hours: Monday and Wednesday 5:30-7:00pm (tentative) or after class
- E-mail: scautis@math.columbia.edu
- Website: includes syllabus, course schedule and homework assignments
  http://www.math.columbia.edu/~scautis/calcIII04/
  Homework solutions and grades will be posted on courseworks.
- Text: Calculus, Early Transcendentals by James Stewart (6th edition) available in the Columbia Bookstore. Note: you should NOT buy the Nook ebook available through the bookstore, see the information in the textbook section of:
  http://www.math.columbia.edu/programs/main/one/calculus.html#textbook

Homework: Homework will be assigned every week on Monday and due the following Monday at the end of class. Assignments will be available on the course homepage. You may get help from any source but you are strongly encouraged to attempt the problems yourself before seeking assistance. Any written work submitted must be your own. Your submitted work must be stapled together and should have your name on every page. Unstapled pages with no name will be discarded. Homework is to be dropped off in the collection box outside office 410 Math Building until 6PM on the day it is due, after that homework will be late. Late homeworks will not be accepted for credit. WARNING: I teach 2 sections so make sure you use the correct box (section 4).

Tests: There will be two midterm exams and a final exam. The tests will be closed book-closed notes tests. Calculators will not be allowed. The (tentative) dates for the two midterms will be: Monday October 4th and Wednesday November 10th. The exams will be held in class during the usual meeting time.

Grades: Grades will be computed as follows: Homework: 20% (the lowest homework score will be dropped), Midterms 20% each, Final 40%.

Help Rooms: Milbank 333 on the Barnard campus – the schedule can be found here:
http://math.columbia.edu/department/milbankhelp.shtml

Final Exam: The final exam schedule will be out shortly. Book your travels accordingly!

Synopsis: The first half of this course is not about calculus but about algebraic techniques for describing geometry in two and three dimensions. For example, there are special ways of “multiplying” points in the plane (the product of complex numbers) and points in space (the cross product of vectors), both of which have geometric as well as algebraic significance.

The second half is about calculus applied to surfaces and curves in space. The lines and planes studied in the first part here appear as first order approximations i.e. derivatives. Ellipses and hyperbolas appear as second order approximations allowing us to distinguish maxima, minima and saddle points.
Other Advice  Unlike a novel reading mathematics is a slow process. One could very well spend hours reading one page. So read it carefully until you understand. Be patient!

Getting help. If you’re having trouble, get help immediately. Everyone who works seriously on mathematics struggles. But if you don’t get help promptly you will soon be completely lost. The first places to look for help are my office hours and the course TA in the help room. Talking to your other classmates can also be very helpful.

Teaching to learn. The best way to learn mathematics is to explain it to someone. You’ll find that, particularly in office hours, I’ll try to get you to explain the ideas. You should also try explaining the material to each other. The person doing the explaining will generally learn more than the explainee.

2. Schedule

Very rough course schedule, subject to later adjustments:

- Sep 8 sect. 12.1, 12.2:  
  Brief overview. Vectors in $\mathbb{R}^n$. Coordinate systems.
- Sep 13/15 sect. 12.3, 12.4:  
  Dot product. Correlation. Cross product.
- Sep 20/22 sect. 12.5:  
  Equations for lines and planes (parametric, implicit). More on lines and planes in space.
- Sep 27/29 sect. 12.6, +:  
  Some more surfaces in space. Review.
- Oct 4 MIDTERM I
- Oct 6 sect. 13.1, 13.2:  
  Parametric curves.
- Oct 11/13 sect. 13.4, Appendix H:  
  Velocity, acceleration. Complex numbers. The complex exponential function.
- Oct 18/20 sect. Appendix H, 2.2, 2.4, 2.5:  
  Continuity and limits of functions of several variables. Partial derivatives.
- Nov 1 Academic Holiday
- Nov 3 sect. 14.4:  
  Tangent planes and linear approximation.
- Nov 8 Review.
- Nov 10 MIDTERM II
- Nov 15/17 sect. 14.6, 14.7:  
- Nov 22/24 sect. 14.8:  
  Lagrange multipliers.
- Nov 29/ Dec 1 sect. 14.8, +:  
  More Lagrange multipliers. Linear transformations and matrices.
- Dec 6/8 sect. 14.5, +:  
  Composition of linear transformations, matrix multiplication, the chain rule.
- Dec 13 Course review