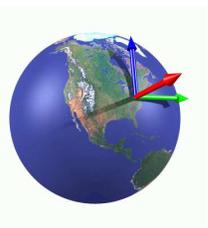## Multivariable Calculus Maths21a, Oliver Knill, Summer 2005

All the course information is on the Maths21a website. Here is a summary of the most crucial information.

Key information

- **URL:** http://www.courses.fas.harvard.edu/~maths21a/
- **Classes:** Emerson 101, Tu, We, Thu, 9:30-11, start sharp on time.
- **Instructor:** Oliver Knill, 434 Science Center, knill@math.harvard.edu
- **Office hours:** Mo 10-12 and by appointment
- **Course assistant:** Benjamin Bakker, bakker@fas.harvard.edu.
- **Problem sessions:**, Thursday 8-9 and/or 1-2 PM, Lecture Hall Emerson 104
- **Homework:**, Weekly HW will be assigned in three parts, one in each lecture. Absolutely no homework extensions but 3 of the 21 lowest HW scores are left out.
- **First hourly:** 14. July, 2005, during class
- **Second hourly:** 28. July, 2005, during class
- **Final:** 16. August, 2005
- **Mathematica:** Will be available on the website.
- **Homework:** is due at the beginning of each lecture.
- **Grades:** midterms total 40 weighted according to quiz, homework 25, project 5, final 30, If the grade on the final exam is higher than the grade from the composite score, then the final grade for the course will be equal to the grade on the final exam, active class participation and attendance can boost your final grade by up to 5
- **Calendar:** 21 sessions: 19 lectures plus 2 midterms during 7 weeks from June 28, 2005 to August 12, 2005. This is followed by a final examination week ending August 19.

```
      +----------+                +------------------+
 Su Mo| Tu We Th | Fr Sa  Events   |Week|Exam|Quiz|Proj|
 -----+----------+------  ----------+------------------+
 27 28| 29 30  1 |  2  3  June     | 1 |    | *  |    |
  4  5|  6  7  8 |  9 10  July     | 2 |    |    |    |
 11 12| 13 14 15 | 16 17  15. hourly| 3 | *  |    |    |
 18 19| 20 21 22 | 23 24           | 4 |    | *  |    |
 25 26| 27 28 29 | 30 31  28. hourly| 5 | *  |    |    |
  1  2|  3  4  5 |  6  7  August   | 6 |    | *  |    |
  8  9| 10 11 12 | 13 14           | 7 |    |    | *  |
 15 16| 17 18 19 | 20 24  17. final| 8 | *  |    |    |
      +----------+                +------------------+
```

Daily Syllabus

1. Week: Geometry and Space

- **28. June:** introduction, space, coordinates, distance
- **29. June:** vectors, dot product, projections
- **30. July:** cross product, lines

2. Week: Functions and Surfaces

- **5. July:** planes, distance formulas
- **6. July:** functions, graphs, quadrics
- **7. July:** implicit and parametric surfaces

3. Week: Curves and Partial Derivatives

- **12. July:** curves, velocity, acceleration, chain rule
- **13. July:** arclength, curvature, partial derivatives
- **14. July:** first midterm (on week 1-2)

4. Week: Extrema and Lagrange Multipliers

- **19. July:** gradient, linearization, tangents
- **20. July:** extrema, second derivative test
- **21. July:** extrema with constraints

5. Week: Double Integrals and Surface Integrals

- **26. July:** double integrals, type I,II regions
- **27. July:** polar coordinates, surface area
- **28. July:** second midterm (on week 3-4)

6. Week: Triple Integrals and Line Integrals

- **2. August:** triple integrals, cylindrical coordinates
- **3. August:** spherical coordinates, vector fields
- **4. August:** line integrals, fundamental thm of lineintegrals

7. Week: Exterior Derivatives and Integral Theorems

- **9. August:** curl and Green theorem
- **10. August:** curl and Stokes theorem
- **11. August:** div and Gauss theorem

8. Week: Review and Final Exam

- **15. August:** Final Review
- **16. August:** Final exam (on week 1-7) 1:30 PM Tuesday