MA213
Spring 2016

Topics for the Final

All final exam conflicts must be resolved two weeks before the exam.

1. Note that the final is 110 points and there will be 7 questions, instead of the usual 6.

   Be sure to study and memorize the formulas from the on line documents.

   You will be permitted to bring two sheets of notes for the final exam. These shall be letter sized, handwritten, two sided and not shared.

2. Review how to integrate ordinary and vector valued functions on curves in the plane or space (line integrals). Similarly for surfaces in the space.

3. Learn the Green's and Stokes' Theorem. Learn how they help you calculate double integrals over surfaces when the line integral around the boundary is easy to compute. Conversely, learn how they can be used for difficult line integrals, if the surface integral is easier.

4. Learn the main applications of these theorems. These include computations of areas of regions (especially Green's Theorem), tests for independence of the line integral from the path of integration and calculation of work for objects moving on given paths.

5. Learn how to compute curl and divergence for given vector functions. These combined with the usual gradient ∇ and the Laplacian should be easy to compute.

   This completes the topics from Chapter 16-17.

6. Learn how to compute double and triple integrals on given regions. Here the technique involves sketching and determining suitable limits. You should also review switching limits of integration in such integrals. This involves understanding the region precisely. There are standard applications to finding volumes/areas centroids etc. You should review the formulas.

   The formula for the surface area should be known to you both for a parametric surface and for a surface given by an equation.

7. Learn how a change of variables is effected in a double or triple integral. This involves computing the jacobian as well as changing limits. Practice this well, it had not appeared on the third exam.

   This completes the topics from Chapter 15.

8. In Chapter 14, we studied partial derivatives. These should have become automatic for you by now. This includes the Chain rule calculations, as well as the derivatives of implicit functions.

9. Recall the formula for the tangent plane of a surface and how it is related to a linear approximation for a function of two variables. The idea of linear approximations extends to more variables easily.

10. Learn how the gradient of a function helps in analyzing its level curves/surfaces. Recall the idea of directional derivatives and how they are related to the gradient.

11. Recall how the gradient leads to the concept of critical points and calculation of max/min points of functions. You should know how to find critical points and test for local max/min using the second derivative test (in two dimensions).

    In higher dimensions, you should know how to find the critical points and then the absolute max/min of functions using common sense.

    Also review the Lagrange Multipliers.

    This finishes the topics from Chapter 14.

12. Chapters 12 and 13 were basic skills for the course. I will ask some explicit computations, just to test what you retain from these. This includes explicit calculations with vectors, geometric meaning of the dot and cross product and calculations of equations of lines and planes.

13. Study equations of space curves and surfaces either given parametrically or by equations.

14. The equations of tangent lines to space curves and tangent planes as well as normal lines to surfaces should be reviewed and well understood. Expect common sense questions which put the various ideas of these chapter together and test your understanding.

    This finishes the topics from Chapters 12-13.