Math 225 Spring 2009 Notes for Final Exam

Review session at 7:00 pm Tuesday, May 5 in CB204W.

Your final exam will be given on Wednesday, May 6, 2009 from 7:00 am to 8:50 am in EP 252. You may bring one page of notes to the exam. Final exam questions will be taken only from material in text sections listed below. (Of course, many preliminary ideas used in these sections were developed in other sections, and cannot be ignored!) The material covered after Exam 3 (sections 15.1-15.5) will receive some emphasis since it has not appeared on previous tests. Assigned homework problems and previous exams are your best guides in preparing for the final exam. Class notes and textbook examples should be useful as well. (Yes, there will be T/F questions.)

The following text sections refer to Calculus, Larson, Hostetler, Edwards, 8th edition.

11.3 Definition of dot product (p 781), Theorem 11.5 (p 782), Theorem 11.6 (p 786) and the definition of work (p 787) are all important.

11.4 Be able to compute cross products. Understand the geometry of cross products (the right hand rule). Theorem 11.8 (1-3) and the idea of torque (p 794) are important.

11.5 Fundamental ideas: parametric equations of a line in space, and the equation of a plane in space. Given two points, find equations of line; given 3 points, find equation of plane. Many variations on these two problems.

12.3 Given position \( \mathbf{r}(t) \), find velocity, acceleration, and speed. Given acceleration and initial conditions, find velocity and position. You should also be familiar with the basic equations of projectile motion (Theorem 12.3 and Example 6 p 853).

12.4 Given \( \mathbf{r}(t) \), be able to find \( \mathbf{T}, \mathbf{N}, \mathbf{a}_r, \) and \( \mathbf{a}_N \). Express \( \mathbf{a} \) in terms of these quantities. Understand how they relate to forces on a moving object. Observe that when a \( t \) value is given, it is generally much easier to substitute \( t \) into \( \mathbf{v}, \mathbf{a} \), etc. before computing dot products or cross products.

13.3 Be able to compute first and second partial derivatives (very important!). Know the common notations used for partial derivatives. The result of Theorem 13.3 is useful.

13.6 Understand and compute gradients and directional derivatives. Properties in Theorem 13.11 are important. (See class notes for a slightly longer list of properties.) Don’t ignore the higher numbered problems in the second assignment for section 13.6.

13.8 Be able to locate critical points for a function \( z = f(x, y) \), and classify each as a relative maximum, relative minimum, or saddle point (similar to Example 3, p 956).

14.1, 14.2, 14.4, 14.6 Be able to compute iterated integrals. Change the order of integration. Set up double and triple integrals for area, volume, mass, center of mass, and moment of inertia.

14.3, 14.7 Set up double integrals in polar coordinates, and triple integrals in cylindrical and spherical coordinates. Convert integrals from one coordinate system to another to simplify the setup and/or evaluation.

15.1 Determine whether a vector field \( \mathbf{F} \) is conservative (Theorem 15.1; we didn’t do problems relating to theorem 15.2). If so, find a potential function \( f \) for \( \mathbf{F} \).

15.2 Compute line integrals (and work) similar to those in the problem set. Observe that there are three different notations used for these integrals, as in problems 7 (\( ds \)), 53 and 57 (\( dx \) and \( dy \)), and 27 (\( \mathbf{F} \cdot d\mathbf{r} \)). Each of these requires a slightly different approach. Also, be sure you can come up with \( \mathbf{r}(t) \) for line segments (as in problem 17), circles or ellipses (as in problem 13), and more general functions \( y = f(x) \) (as in problem 35).

15.3 Evaluate line integrals using the Fundamental Theorem for Line Integrals (Theorem 15.5). Be sure you know when it applies and when it does not! Also, be sure you understand the notation used in problems 15 and 17. (It’s just a disguised version of \( \mathbf{F} \cdot d\mathbf{r} \)).