Math 10B–010
Fall 2009

UPDATED GENERAL INFORMATION — NOVEMBER 25, 2009

Here are some comments regarding the third in-class examination, scheduled for **Wednesday, December 2**.

The exam will cover Sections 7.1 – 7.3 of the text (including the material in the course directory files `comments070`n`.pdf`, where $n = 1, 2, 3$), and it will consist of six problems. Most will be close or identical to assigned problems from the text or problems in the supplementary exercises (files listing and describing these, and also their solutions, are in the course directory). Some problems will require the computation as well as the setting up of the relevant integrals, but the integral computations will be relatively simple, requiring only a handful of simple formulas for indefinite integrals. There will be some problems which require some qualitative reasoning or derivations of formulas.

This exam will contain some general problems on surfaces (for example, using a parametrization to find an equation of the form $F(x, y, z) = 0$ satisfied by the points on the surface, finding the normal vector, especially in cases where the surface is defined as the graph of a function $z = f(x, y)$, and computing the area of a parametrized surface), computing surface integrals for scalar valued functions on surfaces and flux integrals for vector fields on surfaces with preferred normal orientations, using Stokes' Theorem and the Divergence Theorem to compute line integrals as surface integrals and surface integrals as triple integrals or vice versa (in each case there are conditions on the relevant curves and surfaces). In the case of the Divergence Theorem, it is also likely that there will be less computational and more conceptual problems which will require some reasoning; for example, understanding how conditions like $\nabla \cdot \mathbf{F} = 0$ imply that a flux integral over a complicated surface might be equal to a flux integral over a less complicated one with the same boundary, knowing how to derive a formula for the volume of a region D as a flux integral of its bounding surface S (this is in `comments0703.pdf`), or deriving Green's first identity (this was done in class). There may also be a question about computing the average value of a function over a given region in the coordinate plane or 3-space.

Problems on the examination are certain to involve material covered either in this course or Mathematics 10A, including methods for evaluating double and triple integrals as iterated integrals, the use of polar, cylindrical and spherical coordinates, and the formulas for the curl $\nabla \times \mathbf{F}$ and divergence $\nabla \cdot \mathbf{F}$ of a vector field $\mathbf{F}$ (familiarity with some of the identities in the exercises from Chapter 3 might also be worth reviewing, simply to reinforce understanding of the concepts if for no other reason).

Things that will **not** be covered on the examination will include the derivations of Stokes' Theorem and the Divergence Theorem, familiarity with surfaces that cannot be oriented (like the Möbius strip), the material from Section 7.4 of the course text and `comments0704.pdf` on the derivations of basic physical laws and the Differentiation Theorem which is used in these derivations, and the abstract definitions of piecewise smooth surfaces (either the details of the definition will not matter in the discussion or else there will be a very specific example under consideration).

As in earlier examinations, the ability to sketch simple curves and regions will probably be helpful for analyzing problems and finding answers.

Unless indicated otherwise, the logical steps in solving problems should be shown to ensure the maximum possible credit; partial credit will be given for incorrect answers in some cases, depending upon the extent to which the work shown on the exam is valid.

No electronic computing devices will be necessary, and none will be permitted. Likewise, no open books or notes will be permitted.