

Assignment #20

Due on Wednesday, November 19, 2008

Read Chapter 4 on *Differential Forms*, pp. 77–110, in Bressoud.

Read Section 5.4 on *Multiple Integrals*, pp. 120–134, in Bressoud.

Do the following problems

1. Let P and Q denote C^1 scalar fields defined in some open region, D , or \mathbb{R}^2 , and define the 1-form

$$\omega = Pdy - Qdx.$$

- (a) Compute the differential, $d\omega$, of ω .

- (b) Recall that the integral $\int_C \omega$, where C is a simple closed curve in D , gives the flux of the field

$$F = P\hat{i} + Q\hat{j}$$

across the curve C .

What does the Fundamental Theorem of Calculus,

$$\int_T d\omega = \int_{\partial T} \omega,$$

where T is a positively oriented triangle in D , say about the divergence of F and its flux across the boundary of T ?

2. Consider the iterated integral

$$\int_0^1 \int_y^1 e^{-x^2} dx dy.$$

- (a) Identify the region of integration, R , for this integral and sketch it.
- (b) Change the order of integration in the iterated integral and evaluate the double integral

$$\int_R e^{-x^2} dx dy.$$

3. Exercise 2 on page 135 in the text.
4. Exercise 3 on page 135 in the text.
5. Exercise 4 on page 135 in the text.