Math 212-4 - Practice Final/Review Questions

April 15, 2007

1. For material covered on the first two exams (chapters 1-6), review questions from the exams and practice exams. For material in chapters 7 and 8, here are some review questions:

2. Be able to state the Green's, Divergence, and Stoke's Theorem.

3. (a) Evaluate the integral $\int_C ydx - xdy$ where C is the boundary of the triangle with vertices $(0,0,0), (10,0,0), (3,5,0)$.

   (b) Let R be the region in the plane given by $0 \leq x \leq 1, x^2 \leq y \leq x$. Evaluate the integral $\int_C x^2 dx + xydy$, where C is the boundary of R.

4. (a) Find the flux of the vector field $\mathbf{F}(x,y,z) = (x^2, z - 2xy, zx)$ out of the sphere of radius 5 centered at the origin, with the outward normal.

5. Calculate the flux of $\mathbf{F}(x,y,z) = (x^3 + y\sin z, y^3 + z\sin x, z^3)$ across the closed surface bounded by the hemisphere $z = \sqrt{4 - x^2 - y^2}$, and the plane $z = 0$.

6. (a) Find the area of the surface defined by $\mathbf{\Phi}(u,v) = (u+v, u, v), u \in [0,1], v \in [0,1]$.

   (b) Compute the integral of $f = x^2 + y^2 + z^2$ over the surface in part a).

   (c) Calculate the unit normal to the surface.

7. Evaluate $\int_{\mathbf{c}} \mathbf{F} \cdot d\mathbf{s}$ where $\mathbf{c}(t) = (\cos^5 t, \sin^3 t, t^4), t \in [0, \pi]$, and $\mathbf{F}(x,y,z) = (2xyz + \sin x, x^2 z, x^2 y)$. Hint: Is $\mathbf{F}$ a conservative vector field?