Homework 11, due MONDAY 4/10

1. Let $\mathbf{F}(x,y) = \nabla(e^{xy} + x^5 \sin(y^4 \cdot \pi))$. Let $\mathbf{c}(t) = (t^3, 1-t^2), t \in [0,1]$. Find $\int_{\mathbf{c(t)}} \mathbf{F}\, d\mathbf{s}$.

2. Let $\mathbf{F}(x,y) = (xy, x+y)$. Let $\mathbf{c}(t) = (t,0), t \in [0,2]$ and $\mathbf{d}(t) = (t, 1-(t-1)^2), t \in [0,2]$. Compute the line integrals $\int_{\mathbf{c}} \mathbf{F} \cdot d\mathbf{s}$ and $\int_{\mathbf{d}} \mathbf{F} \cdot d\mathbf{s}$. Compare the results and explain why $\mathbf{F}$ is not ∇f for some function f.

3. Let C be the triangle given by $A = (0,0), B = (0,1), C = (1,1)$. View C as a directed simple curve with counterclockwise orientation. Compute $\int_C \mathbf{F} \cdot d\mathbf{s}$ with $\mathbf{F}(x,y) = \nabla f(x,y)$ where $f(x,y) = e^{\sqrt{y}x} \sin(x\cos(y))$.

4. p. 449, problems 14, 16.

5. Find a parametrization of the part of the sphere of radius 3 which lies to the left of the xz–plane. (The choice of the two variables and the choice of Φ should be fairly straightforward, but make sure you get the domain of the variables right).

6. Let C be the 'infinite' cylinder of radius 2 around the z–axis. Now let S be the surface given by cutting C along the planes $z = 3$ and $z = x$. Find a parametrization of S.

7. Let S be the part of the graph of $z = x^2 + y^2 - 4$ which lies below the z–axis. Find a parametrization for S.

8. Let S be the triangle given by the points $P = (0,0,1)$, $Q = (2,3,1)$ and the origin. Find a parametrization for S.

9. p. 459, problems 1, 2 (hint: first find the u, v which give you the point)

10. p. 459, problems 5, 7

11. p. 459, problem 13 (a) – (c)

12. p. 459, problem 14 (for (b) and (c) recall methods from previous chapters),