Homework 6

Math 324F
Advanced Multivariable Calculus
Due on 23rd November 2015

Read sections 16.4, 16.5 and 16.6 from the text.

Problem 16.4.10 (5 points) Use Green's theorem to evaluate the following line integral along the given positively oriented curve. $\int_C (1-y^3)\,dx + (x^3+e^{y^2})\,dy$, where C is the boundary of the region between the circles $x^2+y^2=4$ and $x^2+y^2=9$.

Problem 16.4.18 (5 points) A particle starts at $(-2,0)$, moves along the x-axis to $(2,0)$ and then along the semi-circle $y=\sqrt{4-x^2}$ to the starting point. Use Green's theorem to find the work done on this particle by the force field $\mathbf{F} = x\mathbf{i} + (x^3+3xy^2)\mathbf{j}$.

Problem 16.5.19 (4 points) Is there a vector field $\mathbf{G}$ on $\mathbb{R}^3$ so that $curl\,\mathbf{G} = < x\sin(y), \cos(y), z-xy >$ Explain.

Problem 16.5.27 (6 points) Assume F and G are sufficiently smooth vector fields. Prove $\nabla\cdot(\mathbf{F}\times\mathbf{G}) = \mathbf{G}\cdot curl\,\mathbf{F} - \mathbf{F}\cdot curl\,\mathbf{G}$

Problem 16.6.45 (5 points) Find the area of part of the surface $z=xy$ that lies within $x^2+y^2=1$.

Problem 16.6.61 (5 points) Find the area of part of the sphere $x^2+y^2+z^2=4z$ that lies inside the paraboloid $z=x^2+y^2$.