Math 102 Calculus – Homework 2 – Due on 21 July 2006 Friday, class time

Q-1 Evaluate the integral $\int_C x\, ds$ where C is the curve of intersection of the cylinders $x^2+y^2=1$ and $x^2+z^2=1$ in the first octant and the curve is oriented from $(1,0,0)$ towards $(0,1,1)$.

Q-2 Let C be the unit circle in the plane traversed in the counterclockwise direction, and let **T** denote its unit tangent vector and **n** denote its unit outward normal vector. Let $f(x,y)=\ln\sqrt{x^2+y^2}$. Calculate the following integrals:

$$\int_C \nabla f\cdot \mathbf{T}\, ds \text{ and } \int_C \nabla f\cdot \mathbf{n}\, ds.$$

Q-3 Show that $\omega=(y+z+yz\cos xyz)dx+(x+z+xz\cos xyz)dy+(y+x+xy\cos xyz)dz$ is exact and then evaluate the integral $\int_{(0,0,0)}^{(1,1/2,\pi)} \omega$.

Q-4 Among all simple closed smooth curves in the plane, oriented counterclockwise, find the one along which the work done by $\mathbf{F}=\left(\frac{x^2y}{9}\right)\mathbf{i}+\left(x-\frac{y^3}{75}\right)\mathbf{j}$ is greatest. Calculate this greatest value.

Q-5 Find the area of the plate cut from the plane $3x+4y-5z=6$ by the planes $x=0$, $y=0$ and $7x+y=3$.
