Multivariable Calculus and Differential Equations (MTH-201)

Surprise quiz-1 (03/11/2016)

Time: 60 minutes Maximum Marks: 10

Marks for each questions are given right side.

Problem 1. Suppose C is the curve obtained by intersecting the plane $z = x$ and the cylinder $x^2 + y^2 = 1$ oriented counter-clockwise when viewed from above. Let S be the inside of this ellipse, oriented with the upward-pointing normal. If

$$\mathbf{F} = x\hat{\mathbf{i}} + z\,\hat{\mathbf{j}} + 2y\,\hat{\mathbf{k}},$$

verify Stokes' theorem.

OR

Suppose S is that part of the plane $x + y + z = 1$ in the first octant, oriented with the upward-pointing normal, and let C be its boundary, oriented counter-clockwise when viewed from above. If

$$\mathbf{F} = x^2 - y^2\hat{\mathbf{i}} + y^2 - z^2\,\hat{\mathbf{j}} + z^2 - x^2\,\hat{\mathbf{k}},$$

verify Stokes theorem. (5)

Problem 2. Verify Gauss divergence theorem for vector field

$$\mathbf{F} = xy\hat{\mathbf{i}} + (y^2 + e^{xz^2})\,\hat{\mathbf{j}} + sin(xy)\,\hat{\mathbf{k}},$$

and S is the surface of the region E bounded by the parabolic cylinder $z = 1 - x^2$ and the planes $z = 0, y = 0$, and $y + z = 2$. (4+1)

Note: One marks for home work submission.