MATH 311 - Vector Analysis
Homework # 33- REVIEW OF STOKE's THEOREM

Problems in Schaum's Book: (p. 132-134) 41*, 43*, 62*, 63*, 64, 65*, 66.

41. Evaluate

$$\int_{(0,0)}^{(\pi,2)} (6xy - y^2)\,dx + (x^2y + 3)\,dy$$

along the cyclod $x = \theta - \sin\theta$, $y = 1 - \cos\theta$.

42. Evaluate

$$\oint (3x^2 + 2y)\,dx - (x + 3\cos y)\,dy$$

around the parallelogram having vertices at $(0,0)$, $(2,0)$, $(3,1)$ and $(1,1)$.

62. Prove

$$\iint_{\mathcal{S}} \vec{R} \times d\vec{S} = \vec{0}$$

for any closed surface $\mathcal{S}$.

63. Verify Stoke's theorem for $\vec{A} = (y - z + 2)\vec{\imath} + (yz + 4)\vec{\jmath} - xz\vec{k}$, where $\mathcal{S}$ is the surface of the cube bounded by the planes $x = 0$, $y = 0$, $z = 0$, $x = 2$, $y = 2$, $z = 2$.

64. Verify Stoke's theorem for $\vec{F} = xz\vec{\imath} - y\vec{\jmath} + x^2y\vec{k}$, where $\mathcal{S}$ is the surface of the region bounded by $x = 0$, $y = 0$, $z = 0$,, $2x + y + 2z = 8$ which is not included in the XZ-plane.

65. Evaluate

$$\iint_{\mathcal{S}} \left(\nabla \times \vec{A}\right) \cdot \vec{n}\,dS,$$

where $\vec{A} = (x^2 + y - 4)\vec{\imath} + 3xy\vec{\jmath} + (2xz + z^2)\vec{k}$, and $\mathcal{S}$ is the surface on

(a) the hemisphere $x^2 + y^2 + z^2 = 16$ above the XY-plane,

(b) the paraboloid $z = 4 - (x^2 + y^2)$ above the XY-plane.

66. If $\vec{A} = 2yz\vec{\imath} - (x + 3y - 2)\vec{\jmath} + (x^2 + z)\vec{k}$, evaluate

$$\iint_{\mathcal{S}} \left(\nabla \times \vec{A}\right) \cdot \vec{n}\,dS,$$

over the surface of intersection of the cylinders $x^2 + y^2 = a^2$, $x^2 + z^2 = a^2$ which is included in the first octant.