(b) Use divergence theorem to evaluate,

$$\iint_S (x^3\, dy\, dz + x^2 y\, dz\, dx + x^2 z\, dy\, dx),$$

where S is the sphere, $x^2 + y^2 + z^2 = 1$. 10

(c) If $\vec{A} = 2y\,\vec{i} - z\,\vec{j} - x^2\,\vec{k}$ and S is the surface of the parabolic cylinder $y^2 = 8x$ in the first octant bounded by the planes $y = 4$, $z = 6$, evaluate the surface integral,

$$\iint_S \vec{A} \cdot \hat{n}\, d\vec{S}.$$

10

(d) Use Green's theorem in a plane to evaluate the integral, $\int_C [(2x^2 - y^2)\,dx + (x^2 + y^2)\,dy]$, where C is the boundary of the surface in the xy-plane enclosed by $y = 0$ and the semi-circle, $y = \sqrt{1 - x^2}$. 10