MA 213 Worksheet #24

Section 16.7

1 *16.7.5* Evaluate the surface integral $\iint_S (x + y + z)\ dS$ where S is the parallelogram with parametric equations $x = u + v,\ y = u - v,\ z = 1 + 2u + v$ where $0 \le u \le 2$ and $0 \le v \le 1$.

2 *16.7.19* Evaluate the surface integral

$$\iint_S xz\ dS,$$

where S is the boundary of the region enclosed by the cylinder $y^2 + z^2 = 9$ and the planes $x = 0$ and $x + y = 5$.

3 *16.7.31* Evaluate the surface integral $\iint_S \mathbf{F} \cdot\ d\mathbf{S}$ where $\mathbf{F}$ is the vector field

$$\mathbf{F}(x, y, z) = \langle x^2, y^2, z^2 \rangle$$

and the oriented surface S is the boundary of the solid half-cylinder $0 \le z \le \sqrt{1 - y^2},\ 0 \le x \le 2$. (In other words, find the flux of $\mathbf{F}$ across S.)

Additional Recommended Problems

4 *16.6.11* Evaluate the surface integral

$$\iint_S x\ dS,$$

where S is the triangular region with vertices $(1, 0, 0), (0, -2, 0)$, and $(0, 0, 4)$.

5 *16.7.21* Evaluate the surface integral $\iint_S \mathbf{F} \cdot\ d\mathbf{S}$ where $\mathbf{F}$ is the vector field $\mathbf{F} = ze^{xy}\mathbf{i} - 3ze^{xy}\mathbf{j} + xy\mathbf{k}$ and the oriented surface S is the parallelogram of problem 1, with upward orientation. (In other words, find the flux of $\mathbf{F}$ across S.)

6 *16.7.45* Use Gauss's Law to find the charge contained in the solid hemisphere $x^2 + y^2 + z^2 \le a^2,\ z \ge 0$, if the electric field is

$$\mathbf{E}(x, y, z) = \langle x, y, 2z \rangle.$$