MA 213 Worksheet #25

Section 16.8

1 *16.8.3* Use Stokes' Theorem to evaluate $\iint_S \text{curl } \mathbf{F} \cdot d\mathbf{S}$ for

$$\mathbf{F}(x, y, z) = ze^y\mathbf{i} + x\cos(y)\mathbf{j} + xz\sin(y)\mathbf{k},$$

where S is the hemisphere $x^2 + y^2 + z^2 = 16, y \geq 0$, oriented in the direction of the positive y-axis.

2 *16.8.7* Use Stokes' Theorem to evaluate $\int_C \mathbf{F} \cdot d\mathbf{r}$ (where C is oriented counterclockwise as viewed from above) for

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

where C is the triangle with vertices $(1, 0, 0)$, $(0, 1, 0)$, and $(0, 0, 1)$

3 *16.8.13* Verify that Stokes' Theorem is true for the vector field $\mathbf{F}(x, y, z) = -y\mathbf{i} + x\mathbf{j} - 2\mathbf{k}$ and surface S is the cone $z^2 = x^2 + y^2$, $0 \leq z \leq 4$, oriented downward.

Additional Recommended Problems

4 *16.8.5* Use Stokes' Theorem to evaluate $\iint_S \text{curl } \mathbf{F} \cdot d\mathbf{S}$, for $\mathbf{F}(x, y, z) = xyz\mathbf{i} + xy\mathbf{j} + x^2yz\mathbf{k}$, S consists of the top and the four sides (but not the bottom) of the cube with vertices $(\pm1, \pm1, \pm1)$, oriented outward

5 *16.8.10* Use Stokes' Theorem to evaluate $\int_C \mathbf{F} \cdot d\mathbf{r}$ (where C is oriented counterclockwise as viewed from above) for $\mathbf{F}(x, y, z) = 2y\mathbf{i} + xz\mathbf{j} + (x + y)\mathbf{k}$, and C is the curve of intersection of the plane $z = y + 2$ and the cylinder $x^2 + y^2 = 1$.

6 *16.8.19* If S is a sphere and $\mathbf{F}$ satisfies the hypotheses of Stokes' Theorem, show that $\iint_S \text{curl } \mathbf{F} \cdot d\mathbf{S}$