Math 2110Q Worksheet 20
December 4, 2019

Trigonometric integrals:

$$\int_0^{2\pi} \cos^2(t)\,dt = \int_0^{2\pi} \sin^2(t)\,dt = \pi.$$

1. Let S denote the portion of the sphere $x^2+y^2+z^2=1$ with $z \geq 0$ and let $\hat{n}$ be the unit normal pointing upward on S. Given $\vec{F}(x,y,z) = < z,x,xy >$, calculate

$$\int\int_S \left(\nabla \times \vec{F}\right) \cdot \hat{n}\,dS. \quad \text{(6 pts.)}$$

2. Let S denote the surface of the box

$$V = \{(x,y,z) \mid -1 \leq x \leq 1, -1 \leq y \leq 1, -1 \leq z \leq 1\},$$

and let $\hat{n}$ be the unit normal pointing outward on S. Given $\vec{F}(x,y,z) = < yz, xz, z^3 >$, calculate

$$\int\int_S \vec{F} \cdot \hat{n}\, dS. \quad \text{(4 pts.)}$$