

Reading assignment

Ulaby, 3-1, 3-2, 3-3, Inside back cover

Connor and Salon, I-1 → I-14

Software

Maple (check your solutions)

Problem 1 - Dot and cross productsGiven $\mathbf{A} = r^3 \mathbf{a}_r + 4 \sin\theta \mathbf{a}_\varphi$ and $\mathbf{B} = 3 \mathbf{a}_r + 2 \mathbf{a}_\theta + 12 \sin\theta / r^3 \mathbf{a}_\varphi$ Find $\mathbf{A} \cdot \mathbf{B}$ and $\mathbf{A} \times \mathbf{B}$ **Problem 2 - Area integrals**

For each of the following surfaces, sketch the surface, and find its area.

- $r = 3, 0 \leq \varphi \leq \pi/3, -2 \leq z \leq 2.$
- $0 \leq r \leq 5, \theta = \pi/3, 0 \leq \varphi \leq 2\pi.$
- Identify $d\mathbf{s}$ for each of the surfaces.

Problem 3 - Volume integrals

a. Sketch each of the following volumes and then calculate its value by integrating over the appropriate differential volume element.

- $2 \leq x \leq 5, 0 \leq y \leq 3, -2 \leq z \leq 3.$
- $1 \leq r \leq 3, 0 \leq \varphi \leq \pi/3, -2 \leq z \leq 2.$

b. Integrate the function $(a e^{-r/a} / r)$ over the volume of a sphere of radius a .

Problem 4 - Useful areas and volumes

- What is the surface area of a sphere of radius r ?
- What is the surface area of the side of a cylinder with radius r and length l ?
- What is the volume of a sphere of radius r ?
- What is the volume of a cylinder of radius r and length l ?