

1. Compute $\int \int_S \mathbf{F} \cdot d\mathbf{S}$ if

a) $\mathbf{F} = \langle x^2, y^2, z^2 \rangle$ where S is the surface of the sphere $x^2 + y^2 + z^2 = 25$.

b) $\mathbf{F} = \langle -yz, xz, 1 \rangle$ where S is the boundary of the ellipsoid $\frac{x^2}{4} + \frac{y^2}{4} + z^2 = 1$

c) $\mathbf{F} = (x^3 + y \sin x)\mathbf{i} + (y^3 + z \sin x)\mathbf{j} + 3z\mathbf{k}$ where S is the surface of the hemisphere

$$z = \sqrt{4 - x^2 - y^2}, \quad z = \sqrt{1 - x^2 - y^2} \text{ and the plane } z = 0.$$