

Problem set 01

Problem 1

Use the two methods introduced in Example 1.16 in the book to evaluate the integral

$$I = \int_{\mathcal{V}} d\mathbf{r} \exp(-\mu r) \left(\nabla \cdot \frac{\hat{\mathbf{r}}}{r^2} \right).$$

\mathcal{V} is a sphere with radius R .

Problem 2

An electrostatic potential has the expression $\phi(r) = q \exp(-\mu r)/r$, where q and μ are constants.

- (a) Find the electric field.
- (b) Find the charge distribution creating the potential.
- (c) Find the total charge. Are we missing some charge?

Problem 3

Find curl and divergence of the vector field $\mathbf{F} = (\mathbf{r} \times \mathbf{p})(\mathbf{r} \cdot \mathbf{p})$, where \mathbf{p} is a constant vector.

The problems are due Monday January 20 2025 at 20:00