

Unit-3 Tut-1
Dirac Delt function

1. Evaluate the following integral:

(a) $\int_2^6 (3x^2 - 2x - 1) \delta(x - 3) dx.$

(b) $\int_0^5 \cos x \delta(x - \pi) dx.$

(c) $\int_0^3 x^3 \delta(x + 1) dx.$

(d) $\int_{-\infty}^{\infty} \ln(x + 3) \delta(x + 2) dx.$

2. Show that

$$\delta(kx) = \frac{1}{|k|} \delta(x), \quad , K \text{ is a constant}$$

3. Evaluate the following integral:

(a) $\int_{-2}^2 (2x + 3) \delta(3x) dx.$

(b) $\int_0^2 (x^3 + 3x + 2) \delta(1 - x) dx.$

(c) $\int_{-1}^1 9x^2 \delta(3x + 1) dx.$

(d) $\int_{-\infty}^a \delta(x - b) dx.$

4. Evaluate the following integral:

(a)

$$J = \int_{\mathcal{V}} (r^2 + 2) \nabla \cdot \left(\frac{\hat{\mathbf{r}}}{r^2} \right) d\tau,$$

(b)

$$J = \int_{\mathcal{V}} e^{-r} \left(\nabla \cdot \frac{\hat{\mathbf{r}}}{r^2} \right) d\tau$$

where \mathcal{V} is a sphere of radius R centered at the origin.