

TUTORIAL # 2

- 1.) Charges $+Q$ and $+3Q$ are separated by distance $2m$. A third charge is located such that system is in equilibrium. Find the location and value of the charge in terms of Q .
- 2.) Determine total charge on a line $0 < x < 5$ if $\rho_l = 12x^2 \text{ Mc/m}$.
- 3.) Determine total charge within a sphere $r = 4m$ if $\rho_v = 10/(r \sin\theta) \text{ C/m}^3$
- 4.) A circular disk of radius a carries charge $\rho_s = -C/m^2$. Calculate the potential at $(0, 0, h)$.
- 5.) Plane $x + 2y = 5$ carries charge $\rho_s = 6 \text{ nC/m}^2$. Determining E at $(-1, 0, 1)$.
- 6.) Given that $F = x^2 a_x - xz a_y - y^2 a_z$, calculate the circulation of F around the closed path shown in Figure (1).

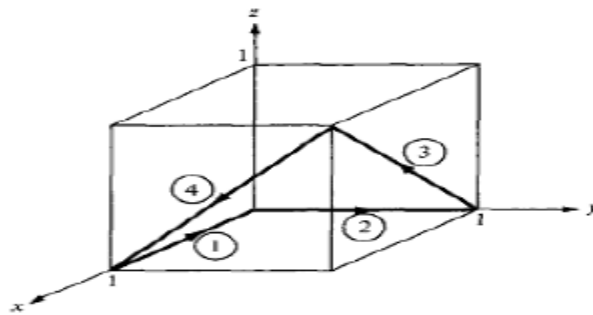


Figure (1)

- 7.) If $H = (x-y) a_x + (x^2+zy) a_y + 5yz a_z$, evaluate $\int H \cdot dl$ along the contour of Figure (3)

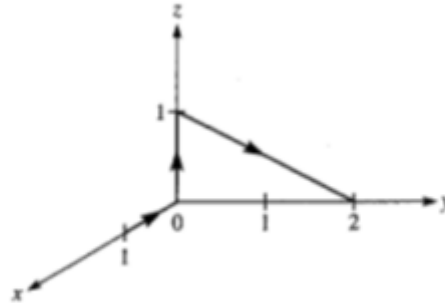


Figure (3)

- 8.) Let $A = 2xy a_x + xz a_y - y a_z$. Evaluate $\int A \cdot dv$ over a rectangular region $0 \leq x \leq 2, 0 \leq y \leq 2, 0 \leq z \leq 2$
- 9.) Determine the gradient of the following scalar fields:
 - a) $U = x^2y + xyz$
 - b) $V = \rho z \sin\theta + z^2 \cos 2\theta + \rho^2$
- 10.) Determine the Laplacian of the scalar fields
 - a) $U = x^2y + xyz$
 - b) $V = \rho z \sin\theta + z^2 \cos 2\theta + \rho^2$