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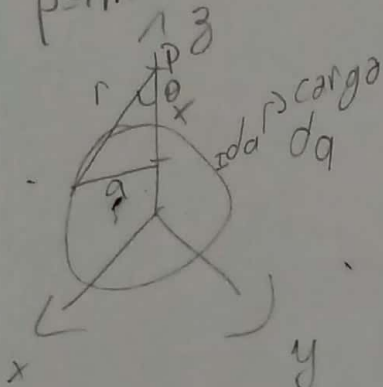
SP3034178

$$\rho_L = 2 \cdot 10^{-9} \text{ C/m}$$

$$V_{AB} = ?$$

$$A = (0, 0, 1) \quad B = (0, 0, 2)$$

$$p = 1 \text{ m}$$



$$V_{AB} = \int_A^B \vec{E} \cdot d\vec{L}$$

$$d\vec{L} = \vec{a}_p dp + \vec{a}_\phi d\phi + \vec{a}_z dz = \vec{a}_z dz$$

$$V_{AB} = \int_1^2 \vec{E} \cdot \vec{a}_z dz = \int_1^2 E_z dz$$

$$dE_z = \frac{\rho_L dl \cos(\theta)}{4\pi\epsilon_0 R^3} = \frac{\rho_L p_z d\phi}{4\pi\epsilon_0 (z^2 + p^2)^{3/2}}$$

$$E_z = \oint dE_z = \int_0^{2\pi} \frac{\rho_L p_z d\phi}{4\pi\epsilon_0 (z^2 + p^2)^{3/2}} = \frac{\rho_L p_z}{2\epsilon_0 (z^2 + p^2)^{3/2}}$$

$$V_{AB} = \int_1^2 E_z dz = \int_1^2 \frac{\rho_L p_z}{2\epsilon_0 (z^2 + p^2)^{3/2}} dz = \frac{\rho_L p_z}{4\epsilon_0} \left[ -\frac{2}{\sqrt{z^2 + p^2}} \right]_1^2$$

$$u = z^2 + p^2 \Rightarrow du = 2z dz \Rightarrow dz = du/2z$$

$$V_{AB} = \frac{2 \cdot 10^{-9} \cdot 1}{2 \cdot \frac{10^{-9}}{36\pi}} \left[ \frac{1}{\sqrt{z^2 + 1}} \right]_1^2 = 29.4 \text{ V}$$

$$V_{AB} = 29.4 \text{ V}$$

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1 % Definindo as constantes
2 E_0 = 1e-9 / (36 * pi);
3 q_dens = 2e-9;
4 raio = 1.0;
5 % Pontos de análise
6 A = [0 0 1]
7 B = [0 0 2]
8 % Caminho de integração
9 comprimento = A - B;
10 passos_em_L = 50;
11 dLv = comprimento / passos_em_L;
12 passos_em_Fi = 50;
13 dFi = (2 * pi) / passos_em_Fi
14 % Realizando as somas
15 V = 0
16 for i = 1:passos_em_L
17     E = [0 0 0];
18     P = B + dLv * (i - .5);
19     for j = 1:passos_em_Fi
20         Fi = dFi * (j + .5);
21         dl = raio * dFi;
22         dQ = q_dens * dl;
23         x = raio * cos(Fi);
24         y = raio * sin(Fi);
25         z = 0;
26         vol = [x y z];
27         R = P - vol;
28         dist = norm(R);
29         E = E + ((R * dQ) / (4 * pi * E_0 * dist ^ 3));
30     endfor
31     V = V - dot(dLv, E);
32 endfor
33 disp(V)

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