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Chapter 23

17, 24, 25, 27, 28, 29, 34, 47, 49, 52

Chapter 24

17, 19, 24, 25, 27, 28, 32, 33, 35, 37

Chapter 24

17. $V_1 = \frac{1}{4\pi\epsilon_0} \frac{q}{d}$

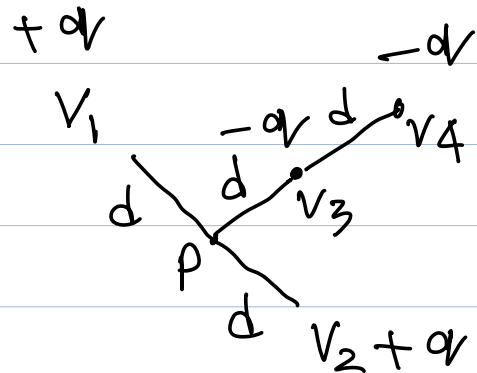
$$V_2 = \frac{1}{4\pi\epsilon_0} \frac{q}{d}$$

$$V_3 = \frac{1}{4\pi\epsilon_0} \frac{-q}{d}$$

$$V_4 = \frac{1}{4\pi\epsilon_0} \frac{-q}{2d}$$

$$V_{\text{total}}(P) = V_1 + V_2 + V_3 + V_4$$

$$= \frac{1}{4\pi\epsilon_0} \frac{q}{2d}$$

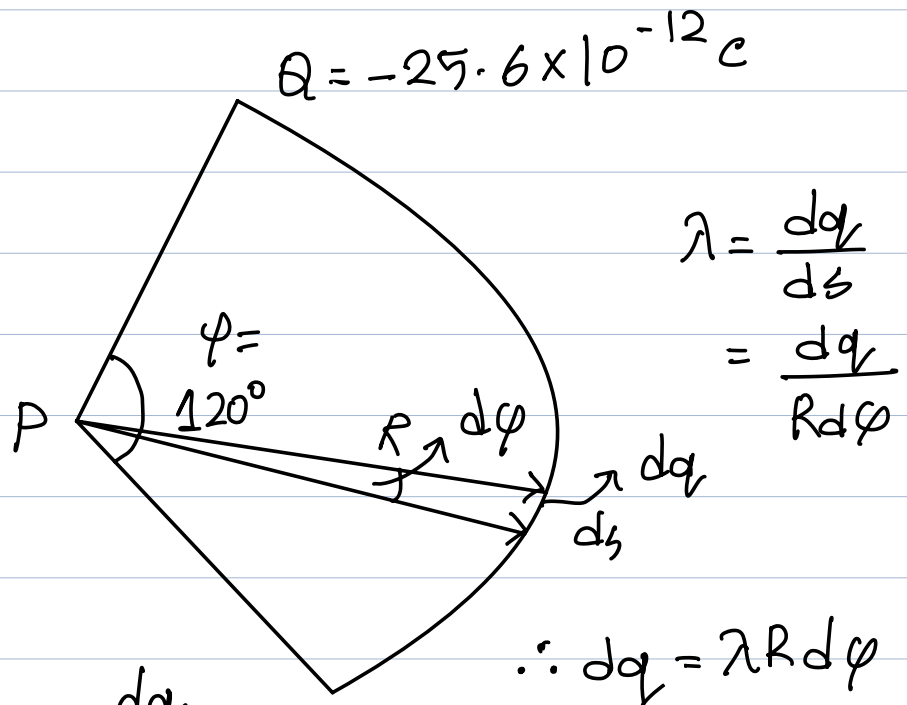


19) Try at home

$$V_1 + V_2 = 0$$

then $\lambda = \dots$

24)



$$dv = \frac{1}{4\pi\epsilon_0} \frac{dq}{R}$$

$$V = \int dv = \int_0^\phi \frac{1}{4\pi\epsilon_0} \frac{\lambda R d\phi}{R}$$

$$= \frac{1}{4\pi\epsilon_0} \frac{\lambda R \phi}{R}$$

$$= \frac{Q}{4\pi\epsilon_0 R}$$

$$\lambda = \frac{Q}{s}$$

$$= \frac{Q}{R\phi}$$

$$Q = \lambda R \phi$$

$$= \frac{-25 \times 10^{-12} \times 9 \times 10^9}{3.7 \times 10^{-2}}$$

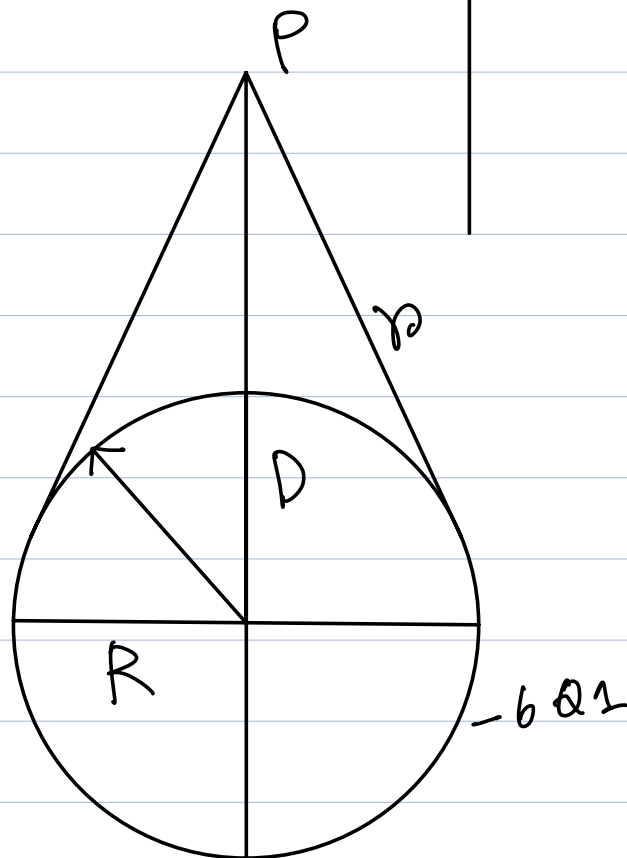
(Ans:)

$$\frac{1}{4\pi\epsilon_0} \frac{q}{\sqrt{R^2 + A^2}} \rightarrow 0$$

$$\frac{q}{4\pi\epsilon_0 R}$$

251

251



$$V_1 = \frac{1}{4\pi\epsilon_0} \frac{Q_1}{R}$$

$$V_2 = \frac{1}{4\pi\epsilon_0} \frac{-6Q_1}{R}$$

$$V = V_1 + V_2$$

$$\lambda_1 = \frac{Q_1}{\left(\frac{2\pi R}{4}\right)}$$

$$\lambda_2 = \frac{Q_2}{\frac{3}{4} \times 2\pi R}$$

$$r = R + r$$

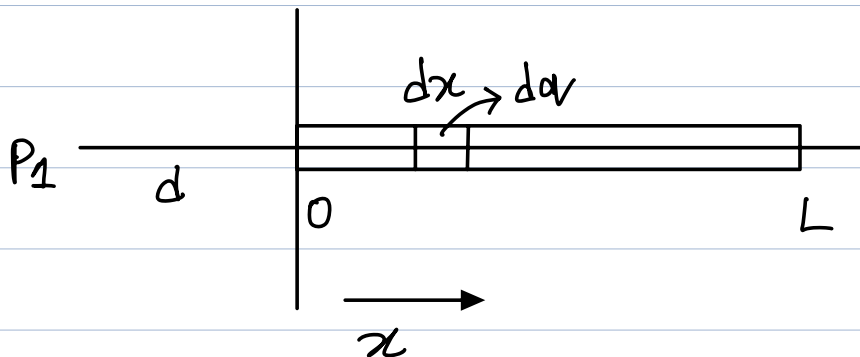
$$V_1 = \frac{1}{4\pi\epsilon_0} \frac{Q_1}{\sqrt{R^2 + r^2}}$$

$$V_2 = \frac{1}{4\pi\epsilon_0} \frac{Q_2}{\sqrt{R^2 + r^2}}$$

27. $V = V_1 + V_2 + V_3$

28, 32. Try at home

33.



$$\lambda = \frac{dq}{dx}$$

$$\Rightarrow dq = \lambda dx$$

$$dv = \frac{1}{4\pi\epsilon_0} \frac{dq}{x+d}$$

$$V = \int_0^L dv$$

$$= \frac{1}{4\pi\epsilon_0} \int_0^L \frac{\lambda dx}{x+d}$$

$$= \frac{1}{4\pi\epsilon_0} \int_0^L \frac{Cx}{x+d} dx$$

$$= \frac{C}{4\pi\epsilon_0} \int_0^L \frac{x}{x+d} dx$$

$$= \frac{C}{4\pi\epsilon_0} \int_0^L \frac{x+d-d}{x+d} dx$$

$$= \frac{C}{4\pi\epsilon_0} \int_0^L \left(1 - \frac{d}{x+d}\right) dx$$

$$= \frac{C}{4\pi\epsilon_0} [L - d \ln(L+d) - 0 + d \ln(d)]$$

$$= \frac{C}{4\pi\epsilon_0} \left[L - d \ln\left(\frac{L+d}{d}\right) \right]$$

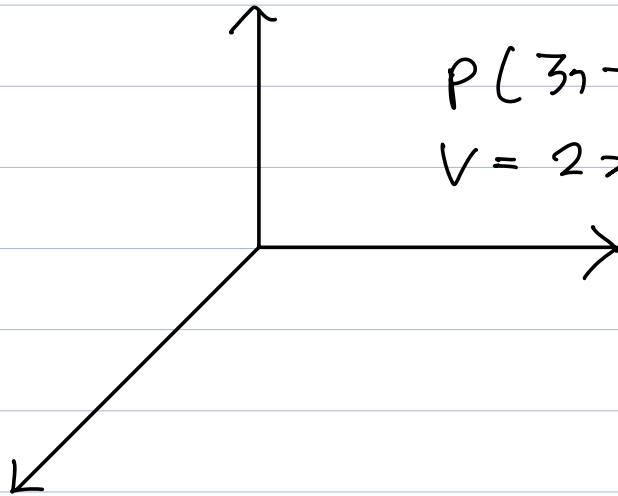
35. Toy at home

$$\vec{r} = 3\hat{i} - 2\hat{j} + 4\hat{k}$$

37.

$$\rho(3, -2, -4)$$

$$V = 2xyz^2$$



$$\frac{\partial V}{\partial x} = 2yz^2$$

$$\frac{\partial V}{\partial y} = 2xz^2$$

$$\frac{\partial V}{\partial z} = 4xyz$$

$$\vec{E} = E_x \hat{i} + E_y \hat{j} + E_z \hat{k}$$

$$= -\frac{\partial V}{\partial x} \hat{i} - \frac{\partial V}{\partial y} \hat{j} - \frac{\partial V}{\partial z} \hat{k}$$

$$= -2yz^2 \hat{i} - 2xz^2 \hat{j} - 4xyz \hat{k}$$

$$\vec{E} = 64\hat{i} - 96\hat{j} + 96\hat{k}$$

$$E = -\sqrt{64^r + (-06)^r + 06^r}$$