

Q1: A plastic rod has been bent into a circle of radius $R = 8.00 \text{ cm}$. It has a charge $Q_1 = +7.00 \text{ pC}$ uniformly distributed along one quarter of its circumference and a charge $Q_2 = -6Q_1$ uniformly distributed along the rest of the circumference. With $V = 0$ at infinity, what is the electric potential at point P, on the central axis of the circle at distance $D = 2.00 \text{ cm}$ from the center?

$$V = k \int \frac{dq}{r}$$

$$= k \int \frac{dQ}{\sqrt{R^2 + D^2}}$$

$$= \frac{kQ}{\sqrt{R^2 + D^2}}$$

$$= \frac{k(Q_1 + Q_2)}{\sqrt{R^2 + D^2}}$$

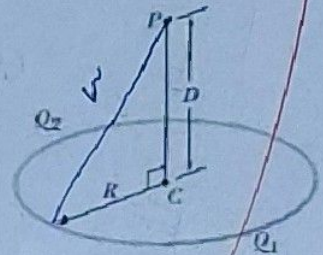
$$= \frac{k(Q + -6Q_1)}{\sqrt{R^2 + D^2}}$$

$$= \frac{-5kQ_1}{\sqrt{R^2 + D^2}}$$

$$= \frac{-5(9 \times 10^9)(7 \times 10^{-12})}{\sqrt{(8 \times 10^{-2})^2 + (2 \times 10^{-2})^2}}$$

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$$\sqrt{(8 \times 10^{-2})^2 + (2 \times 10^{-2})^2}$$



~~$$V = -3.8199 \text{ V}$$~~

Q2: What is the magnitude of the electric field at the point $(-1, -2, 4)$ m. the electric potential in the region is given by $V = 2x^3y^2z^2$, where V is in volts and coordinates $x, y,$ and z are in meters?

$|E| = ?$

$$E_x = \frac{dV}{dx}, E_y = \frac{dV}{dy}, E_z = \frac{dV}{dz}$$

$$E_x = \frac{dV}{dx} = 2y^2z^2 = 2(-2)^2(4)^2 = 256 \text{ N/m}$$

$$E_y = \frac{dV}{dy} = 2x^3y^2z^2 = 6x^3yz^2 = 384 \text{ N/m}$$

$$E_z = 4x^3y^2z = 128 \text{ N/m}$$

~~$E =$~~

$$|E| = \sqrt{(E_x)^2 + (E_y)^2 + (E_z)^2}$$

~~$$|E| = 288 \text{ N/C}$$~~

$$|E| = 313.5 \text{ N/m}$$