Q1: A plastic rod has been bent into a circle of radius R = 8.00 cm. It has a charge $Q_1 = +7.00$ 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 = 2.00cm from the center?

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

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

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

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

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

$$= \frac{-5KQ_1}{\sqrt{R^2+D^2}}$$

$$= \frac{-5(9\times10^{9})(7\times10^{-12})}{\sqrt{(8\times10^{-2})^2+(2\times10^{-2})^2}}$$

$$V = -3.8199\,V$$

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

$|E| = ?$

$E_x = \frac{dv}{dx}$, $E_y = \frac{dv}{dy}$, $E_z = \frac{dv}{dz}$:-

$E_x = \frac{dv}{dx} = 2 y^3 z^2 = 2(-2)^3(4)^2 = -256$ N/m

$E_y = \frac{dv}{dy} = 6 x y^2 z^2 = 6 \times y^2 z^2 = 384$ N/m

$E_z = 4 x y^3 z = $ ~~N/m~~ 128 N/m

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

~~$|E| = 288$ N/C~~

$|E| = 313.5$ N/m