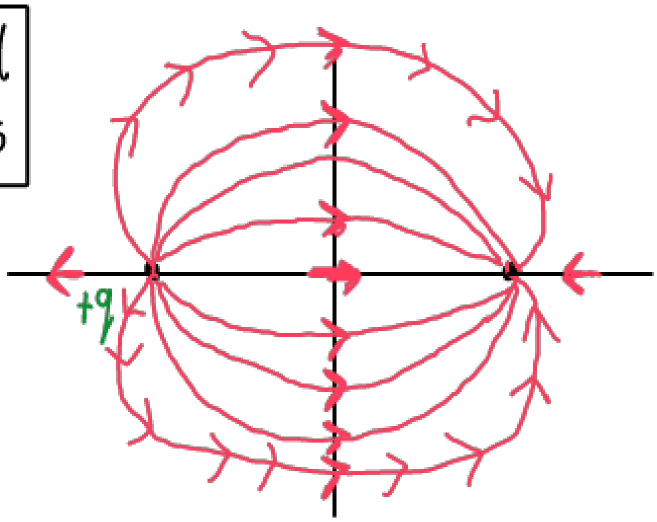
Electric Potential

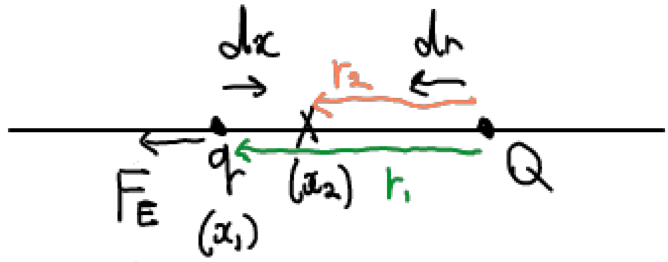
Field Lines



Reference where $r_1 \to \infty$

$$U_E(r) = \frac{Qq}{4\pi\epsilon_0}\frac{1}{r}$$

$$\frac{U_E}{q} \equiv V = \frac{Q}{4\pi\epsilon_0}\frac{1}{r}$$

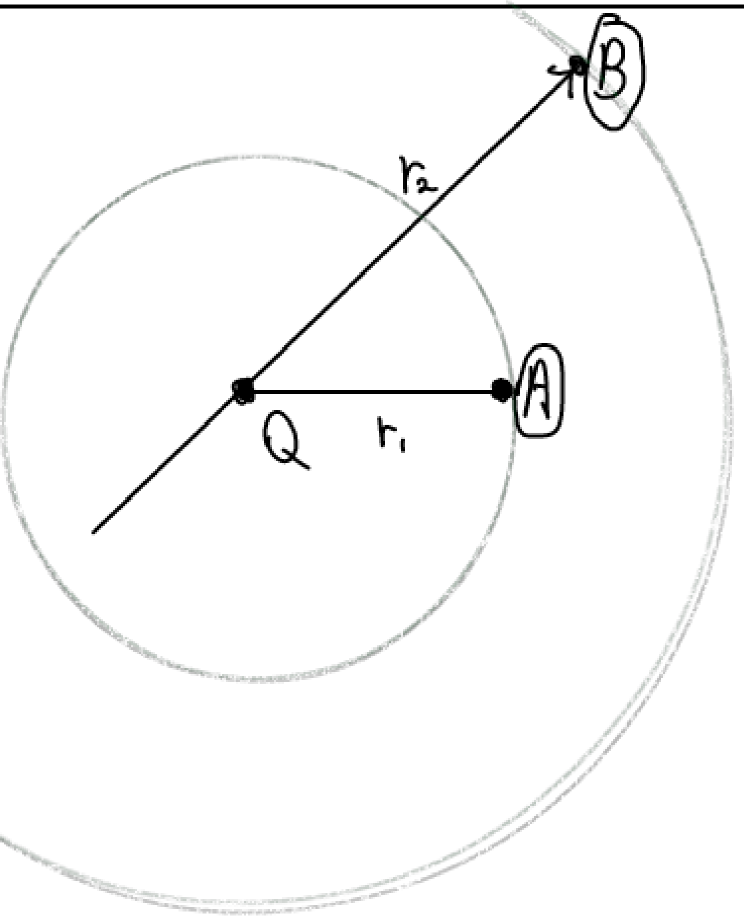


$$W = \int_{x_1}^{x_2} \vec{F}\cdot\vec{dx}$$

$$= -\int_{r_1}^{r_2} \frac{qQ}{4\pi\epsilon_0 r^2}\,dr$$

$$= \frac{Qq}{4\pi\epsilon_0}\left[\frac{1}{r_2} - \frac{1}{r_1}\right]$$

$$= \Delta U_E$$



$$V_B = \frac{Q}{4\pi\epsilon_0}\frac{1}{r_2}$$

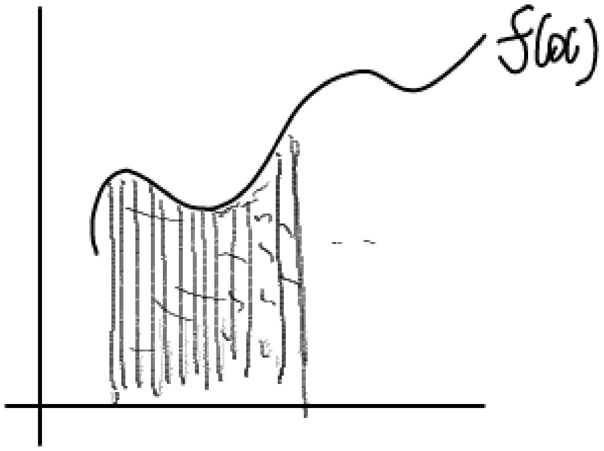
$$V_A = \frac{Q}{4\pi\epsilon_0}\frac{1}{r_1}$$

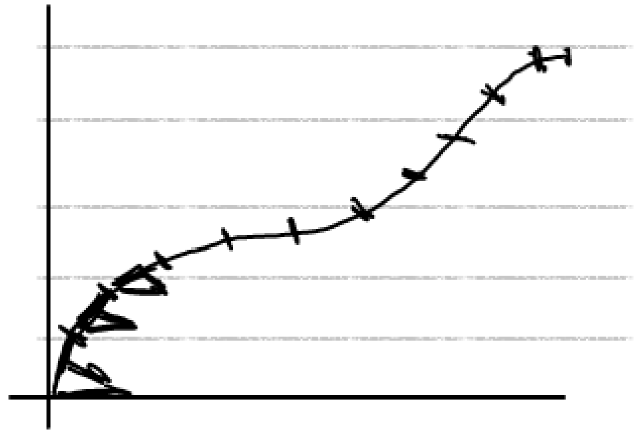
$$\Delta V = V_B - V_A$$

$$\Delta V = \frac{Q}{4\pi\epsilon_0}\left(\frac{1}{r_2} - \frac{1}{r_1}\right)$$

$$= -\frac{W}{q}$$

$$\Delta V = -\frac{W}{q} = -\int_{A}^{B} \vec{E}\cdot\vec{ds} = V_{B} - V_{A}$$ ← Line Integral





$$(E\Delta S_1 \cos\theta_1) + (E\Delta S_2 \cos\theta_2) + \cdots\cdots$$

$$V\Big|_{Q} = \frac{Q}{4\pi\epsilon_0}\frac{1}{r}$$