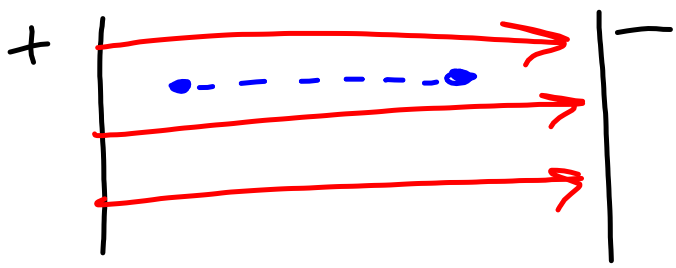
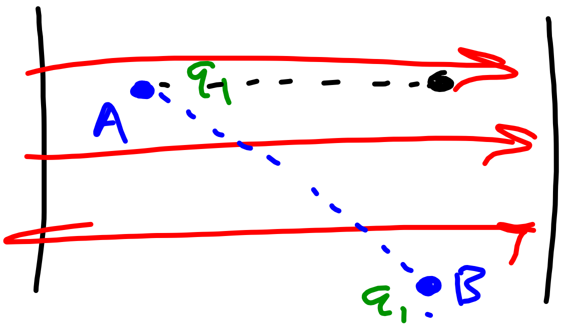
POTENTIAL DIFFERENCE

$$\Delta U_e = q \Delta V$$

$$\Delta V = \frac{\Delta U_e}{q} \qquad \left[\frac{J}{C} \equiv V \right]$$

Volt





$$\Delta V = -\bar{E} \cdot \Delta \bar{l}$$

$$= -\langle E_x, E_y, E_z \rangle \cdot \langle \Delta x, \Delta y, \Delta z \rangle$$

$$= -(E_x \Delta x + E_y \Delta y + E_z \Delta z)$$

$$\Delta V = -\int \bar{E} \cdot d\bar{r}$$

$d\bar{r}$ is displacement vector

$$d\bar{r} = \langle dx, dy, dz \rangle$$

$$\Delta V = -\int (E_x dx) + (E_y dy) + (E_z dz).$$

$$= -\int E_x dx - \int E_y dy - \int E_z dz$$

$$\Delta V = - E_x \Delta x$$

$$E_x = -\frac{\Delta V}{\Delta x}$$

$$E_x = -\lim_{\Delta x \to \emptyset} \frac{\Delta V}{\Delta x} = -\frac{dV}{dx}$$

Electric field is the negative gradient of the potential.

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

$$E_x = -\frac{\partial V}{\partial x} \quad E_y = -\frac{\partial V}{\partial y} \quad E_z = -\frac{\partial V}{\partial z}$$

Example: $f(x,y,z) = x^2 y^3 z^4$

$$\frac{\partial f}{\partial x} = 2x\,y^3 z^4$$

$$\frac{\partial f}{\partial y} = 3x^2 y^2 z^4$$

$$\frac{\partial f}{\partial z} = 4x^2 y^3 z^3$$

$$\bar{E} = -\bar{\nabla} V$$

↳ "nabla"

the gradient

$$\bar{\nabla} = \left\langle \frac{\partial}{\partial x}, \frac{\partial}{\partial y}, \frac{\partial}{\partial z} \right\rangle$$

P26, P29, P30

P46, P71, P72