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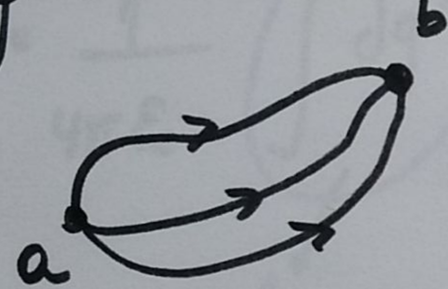
$$W^{ab}_{\bar F_e} \underset{\text{(cuasiest.)}}{=} -W^{ab}_{\bar F_{ext}} = q_0 \int_a^b \vec{E}\cdot d\vec{\ell}$$

$$\left(\bar\nabla \cdot \bar E = \rho / \varepsilon_0 \right)$$

→ $\bar\nabla \times \bar E = \bar 0$ → IRROTACIONAL

→ $W_{\bigcirc} = 0 \qquad \oint \bar E \cdot d\bar\ell = 0$

→ W^{ab}



→ $W_{\bar F_e} = -\Delta U_e$ → $\Delta V = \dfrac{\Delta U_e}{q_0}$ $\begin{cases} W^{ab}_{\bar F_{ext}} = q_0 \, \Delta V^{ab} \\ W^{ab}_{\bar F_e} = -q_0 \, \Delta V^{ab} \end{cases}$

$$\Delta V^{ab} = V(b) - V(a) = -\int_a^b \bar E \cdot d\bar\ell \quad ; \quad \bar E = -\bar\nabla V$$

$$\Delta V^{ab} = V(b) - V(a) = \frac{q}{4\pi\varepsilon_0}\left(\frac{1}{r_b} - \frac{1}{r_a}\right)$$ 1 carga q

(2)

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$$\Delta V^{ab} = V(b) - V(a) = \frac{1}{4\pi\varepsilon_0}\sum_{i=1}^{N} q_i\left[\frac{1}{|\bar{r}_b - \bar{r}_i|} - \frac{1}{|\bar{r}_a - \bar{r}_i|}\right]$$ N cargas q_i

$$\Delta V^{ab} = V(b) - V(a) = \frac{1}{4\pi\varepsilon_0}\int dq'\left[\frac{1}{|\bar{r}_b - \bar{r}'|} - \frac{1}{|\bar{r}_a - \bar{r}'|}\right]$$ dist. continua

$(\lambda' dl' \,;\, \sigma' ds' \,,\, \rho' dV')$

OJO! $\boxed{\text{dist. acotadas}}$

Dist. NO Acotada $\rightsquigarrow$ $$\underbrace{\Delta V^{ab} = V(b) - V(a) = -\int_a^b \bar{E}\cdot d\bar{l}}$$

③

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ΔV : Diferencia de potencial

$\underbrace{\quad}$
$\parallel$

→ $V(b) - V(a)$

→ $V(\bar{r}) - V(\bar{r}_{ref})$

ELIJO

$\int^{\bar{r}_{ref}}$ → ∞ — sólo válida dist. acotadas

$V(\bar{r}_{ref})$ → 0

NO ACOTADA

$-\int_a^b \bar{E} \cdot d\bar{l}$

$-\int_{\bar{r}_{ref}}^{\bar{r}} \bar{E} \cdot d\bar{l}$

$\bar{r}_{ref}$ → ~~NO ∞~~

$$\Delta V = V(\bar{r}) - V(\bar{r}_{ref}) = \frac{1}{4\pi\varepsilon_0} \sum_{i=1}^{N} q_i \left[\frac{1}{|\bar{r} - \bar{r}_i|} - \frac{1}{|\bar{r}_{ref} - \bar{r}_i|} \right]$$ (4)

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Si $\bar{r}_{ref} \to \infty$ y $V(\bar{r}_{ref}) = 0$

$$\Rightarrow V(\bar{r}) = \frac{1}{4\pi\varepsilon_0} \sum_{i=1}^{N} q_i \frac{1}{|\bar{r} - \bar{r}_i|}$$

$$\Rightarrow V(\bar{r}) = \frac{1}{4\pi\varepsilon_0} \int \frac{\delta q'}{|\bar{r} - \bar{r}'|}$$

DIST. <u>ACOTADAS</u>

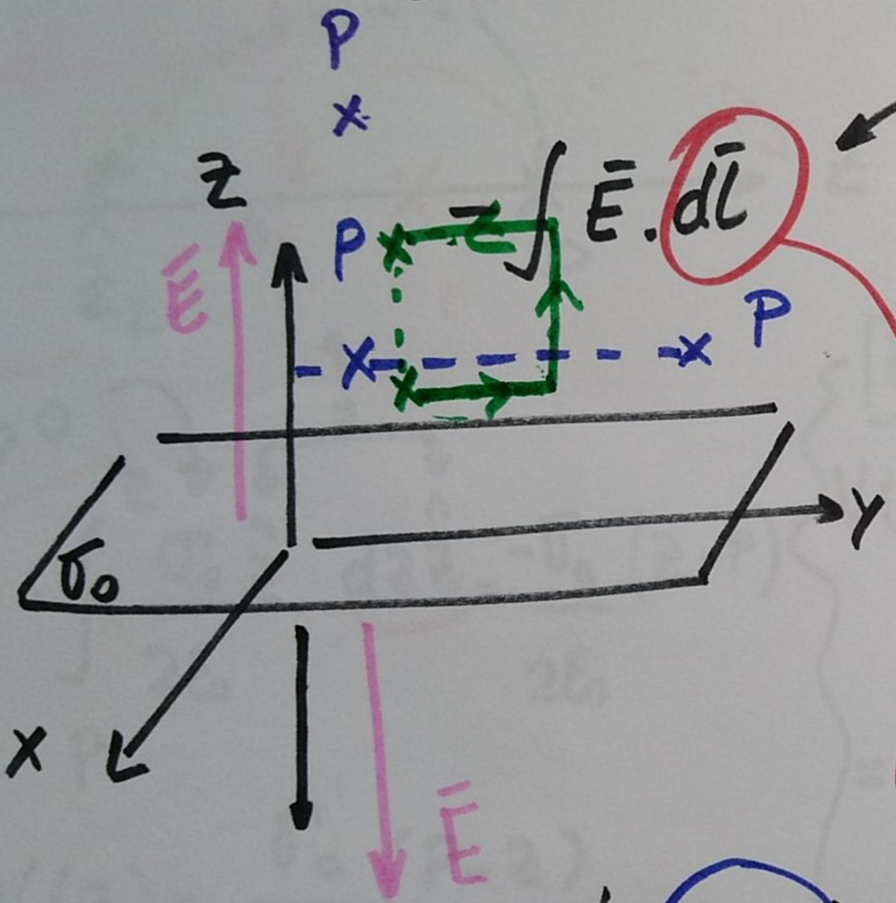
$\bar{r}_{ref} \to \infty$

$V(\bar{r}_{ref}) = V(\infty) = 0$

Ejemplo: DISTRIBUCIÓN PLANA "∞", σ_0

$\Delta V \quad \forall \bar{r}$

NO ACOTADA



$\int \bar{E} \cdot d\bar{l}$

$\bar{r}_{ref} \neq \infty$

$$\vec{E} = \begin{cases} \dfrac{\sigma_0}{2\varepsilon_0}\,\hat{z} & z > 0 \\ \dfrac{-\sigma_0}{2\varepsilon_0}\,\hat{z} & z < 0 \end{cases}$$

ELIJO!!: $\vec{dl} = dz\,\hat{z}$

$$\Delta V = V(\bar{r}) - V(\bar{r}_{ref}) = V(z) - V(p) = -\int_{p}^{z} \bar{E} \cdot \bar{dl}$$

P

z_p

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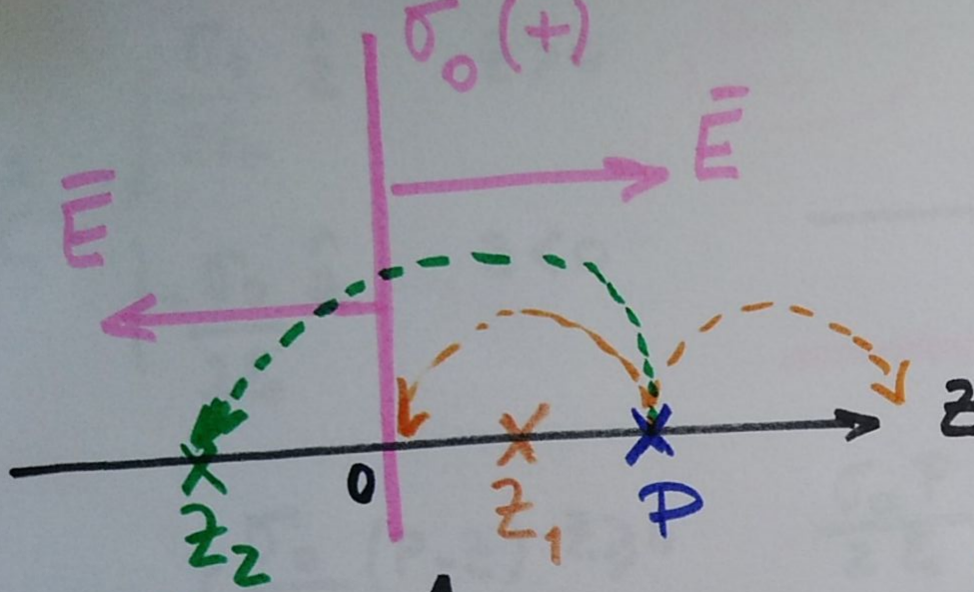

$$\Delta V = V(z) - \cancel{V(P)} = -\int_{P}^{z} \bar{E} \cdot d\bar{l}$$

0V

$$d\bar{l} = dz\,\hat{z}$$

$\boxed{z > 0}$

$$V(z) = -\int_{P}^{z} \frac{\sigma_0}{2\varepsilon_0} \overbrace{\hat{z} \cdot dz\,\hat{z}}^{1} = \frac{-\sigma_0}{2\varepsilon_0}(z - P)$$

$$\Rightarrow V(z) = \frac{\sigma_0}{2\varepsilon_0}(P - z)$$

$\boxed{z < 0}$

$$V(z) = -\left[\int_{P}^{0} \frac{\sigma_0}{2\varepsilon_0}\hat{z} \cdot dz\,\hat{z} + \int_{0}^{z}\left(\frac{-\sigma_0}{2\varepsilon_0}\right)\hat{z} \cdot dz\,\hat{z}\right]$$

$$= -\left[\frac{\sigma_0}{2\varepsilon_0}(0 - P) - \frac{\sigma_0}{2\varepsilon_0}(z - 0)\right]$$

$$\Rightarrow V(z) = \frac{\sigma_0}{2\varepsilon_0}(z + P)$$

$$V(z) = \begin{cases} \dfrac{\sigma_0}{2\varepsilon_0}(P - z) & z \geq 0 \\ \dfrac{\sigma_0}{2\varepsilon_0}(z + P) & z \leq 0 \end{cases}$$

$$V(z=0) = \frac{\sigma_0}{2\varepsilon_0} P$$

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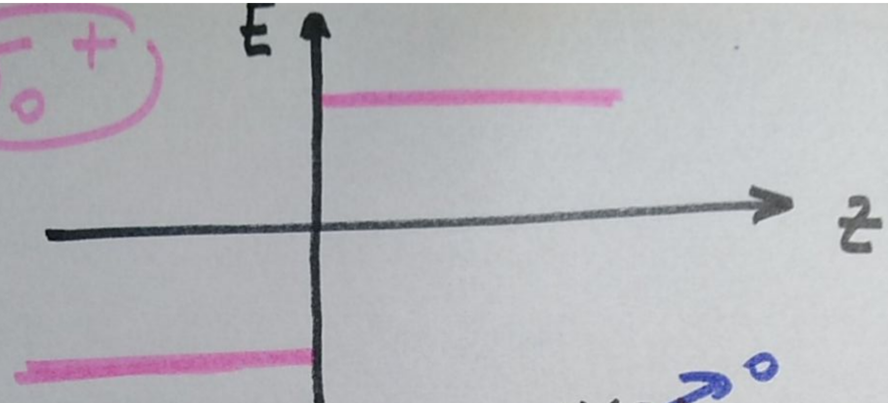
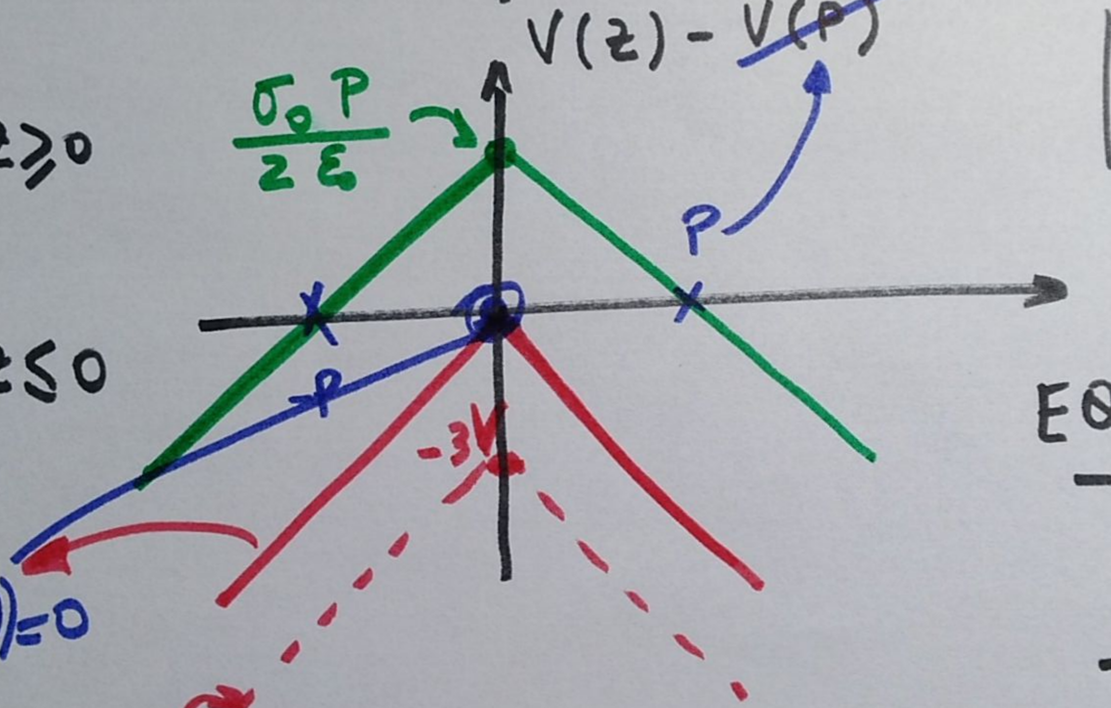
$$\bar{E} = \begin{cases} \dfrac{\sigma_0}{2\varepsilon_0}\hat{z} & z>0 \\[2ex] -\dfrac{\sigma_0}{2\varepsilon_0}\hat{z} & z<0 \end{cases}$$

$\sigma_0 +$



$$V(z) = \begin{cases} \dfrac{\sigma_0}{2\varepsilon_0}(P-z) & z\geq 0 \\[2ex] \dfrac{\sigma_0}{2\varepsilon_0}(P+z) & z\leq 0 \end{cases}$$



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

EQUIPOTENCIALES

↓

$\perp \bar{E}$

Si $P = 0$ $V(0) = 0$

$\rightarrow V(0) = -3V$

$$\boxed{V(z) - V(0) = V(z) - (-3V)}$$