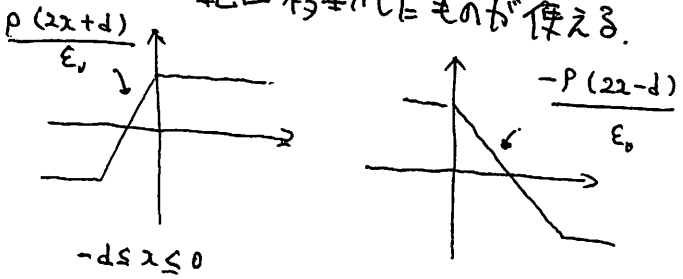
(2) 単位面積より $S = 1$.

$$W = \int E^2 \cdot \frac{1}{2}\varepsilon_0 \cdot dv$$

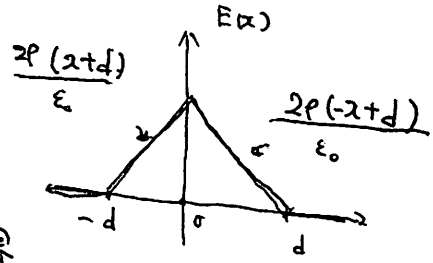
$$= \frac{1}{2}\varepsilon_0 \left\{ \frac{\rho(2x+d)}{\varepsilon_0} \right\}^2 \cdot d.$$

$$= \frac{\rho d(4x^2+4xd+d^2)}{2\varepsilon_0}$$

(3) (1)の時に範囲移動したものが使える.



グラフを足しあわせる.



電界

$-d \leq x \leq 0$

$$E(x) = \frac{2\rho(x+d)}{\varepsilon_0}$$

$0 \leq x \leq d$

$$E(x) = \frac{2\rho(-x+d)}{\varepsilon_0}$$

電位. $V(d) = 0$ が基準より.

$-d \leq x \leq 0$.

$$V = \frac{\rho}{\varepsilon_0} d^2 - \int_0^{-d} E(x)\,dx$$

$$= \cdots$$

$$= \frac{\rho}{\varepsilon_0} d^2 + \frac{\rho}{\varepsilon_0} d^2$$

$$= \frac{2\rho d^2}{\varepsilon_0}$$

$0 \leq x \leq d$.

$$V = -\int_d^0 E(x)\,dx$$

$$= \cdots$$

$$= \frac{\rho}{\varepsilon_0} d^2.$$