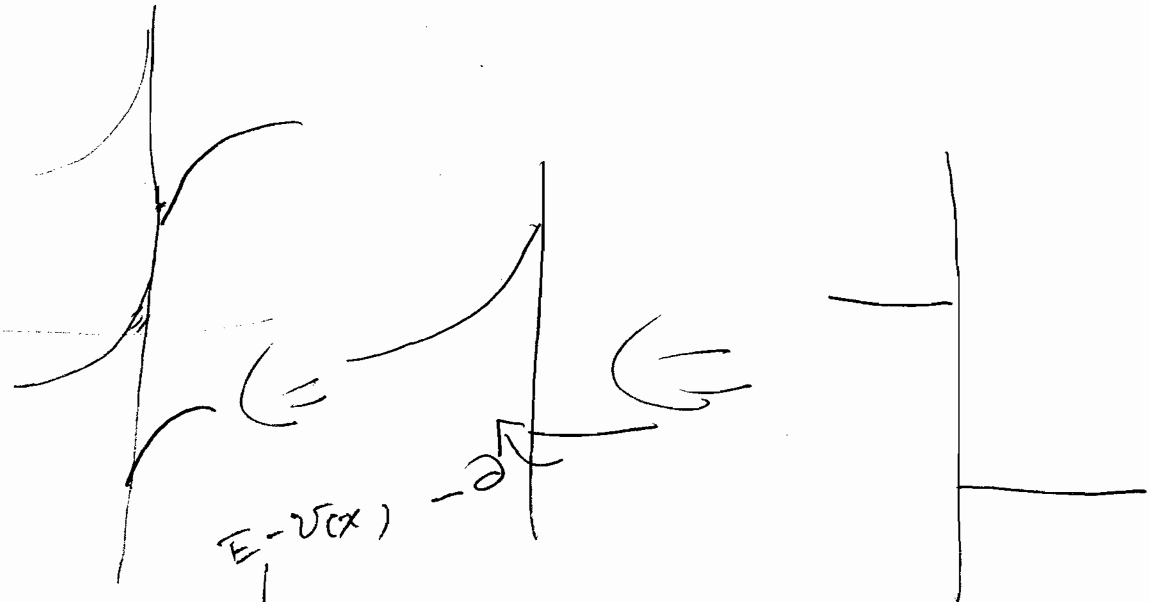
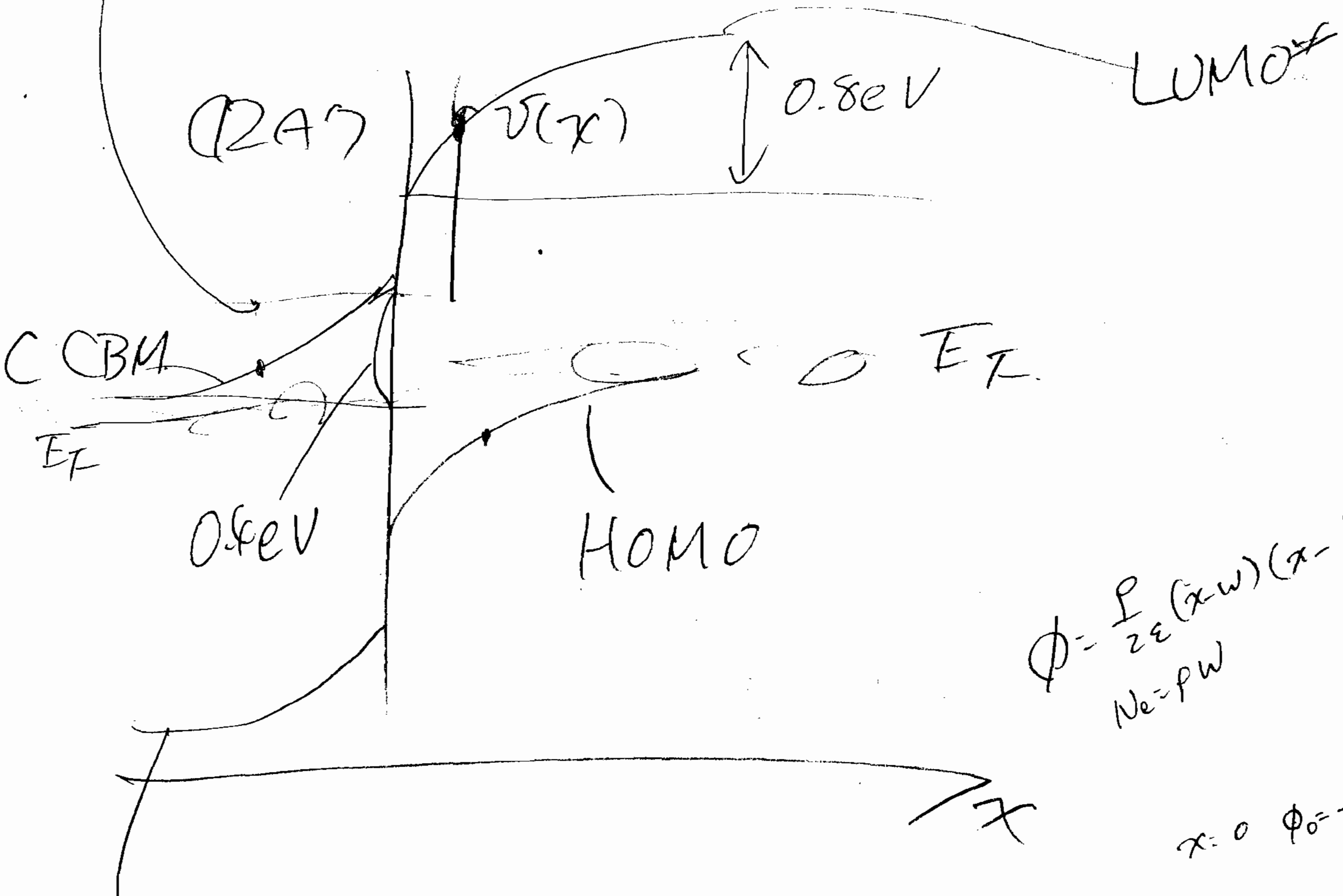



$$\rho(x) = \int_{E_{C0}}^{\infty} f(E - E_F)\, D(E - v(x))\, dE$$

$$N(x) = \cancel{f(v(x) - E_F)} \cdot N_C\, e^{-\frac{v(x) - E_F}{kT}}$$




$$\phi = \frac{\rho}{2\varepsilon}(x-w)\left(x - \frac{2\varepsilon}{\rho w}\phi_0\right)$$

$$N_e = \rho w$$

$$x = 0 \quad \phi_0 = -\frac{\rho w}{2\varepsilon}\alpha$$

$$\ddot{\phi} = \rho/\varepsilon \qquad \dot{\phi} = \frac{\rho}{\varepsilon}x + C_1 \qquad \phi = \frac{\rho}{2\varepsilon}x^2 + C_1 x + C_2$$

$$= \frac{\rho}{2\varepsilon}(x - w)(x + \alpha)$$

$j = e n_0 N_e \mu E_0$

$\dfrac{d^2\phi}{dx^2} = \dfrac{\rho(x)}{\varepsilon}$ $\quad \rho(x) = \{-n(x) + N_e\} e/\varepsilon$

$-j = -e n(x) \mu E(x)$

$j = +e\, n(x) \mu \dfrac{d\phi}{dx}$ $\quad E = -\dfrac{d\phi}{dx}$

$\ddot{\phi}(x) = -\dfrac{e}{\varepsilon} n(x) + \dfrac{e}{\varepsilon} N_e$

$= -\dfrac{j}{\dot{\phi}\mu\varepsilon} + \dfrac{e N_e}{\varepsilon}$

$-\dfrac{\ddot{j}}{\dot{\phi}} \dfrac{e N_e E_0}{\varepsilon_1} = \dfrac{e N_e}{\varepsilon}\left(-\dfrac{E_0}{\dot{\phi}} + 1\right)$

$e(x) = \dfrac{d\phi(x)}{dx}$

$\dfrac{de(x)}{dx} = \dfrac{j}{\mu\varepsilon} \dfrac{1}{e(x)} + \dfrac{e N_e}{\varepsilon}$

$e\dot{e} = \dfrac{e N_e}{\varepsilon} e + \dfrac{j}{\mu\varepsilon}$

$\dfrac{1}{2} e^2 = \dfrac{e N_e}{\varepsilon} V + \dfrac{j}{\mu\varepsilon} x + C'$

$\dfrac{dV}{dx} = \sqrt{e N_e V + \dfrac{2j}{\mu\varepsilon} x + C''}$

$\left( = \dfrac{j}{e N_e \mu} \right)$

$N_e = 0.$

$\ddot{\phi}\dot{\phi} = +\dfrac{j}{\mu\varepsilon}$

$\dfrac{1}{2}(\dot{\phi})^2 = \left(+\dfrac{j}{\mu\varepsilon} x + C_1\right)$

$\dot{\phi}(0) = 0$

$\Rightarrow \dot{\phi} = \sqrt{+\dfrac{2j}{\mu\varepsilon} x}$

$\phi = \dfrac{2}{3}\sqrt{+\dfrac{2j}{\mu\varepsilon}}\, x^{\frac{3}{2}} \Big|_0^d$

$\therefore V = \dfrac{2}{3}\sqrt{\dfrac{2j}{\mu\varepsilon}}\, d^{\frac{3}{2}}$ $\quad V^2 = \dfrac{8j}{9\mu\varepsilon} d^3$

$j = \dfrac{9}{8} \dfrac{\mu\varepsilon}{d} E^2$