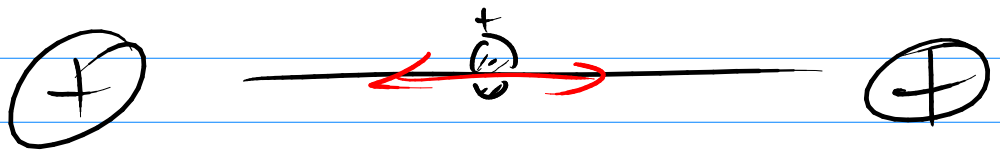
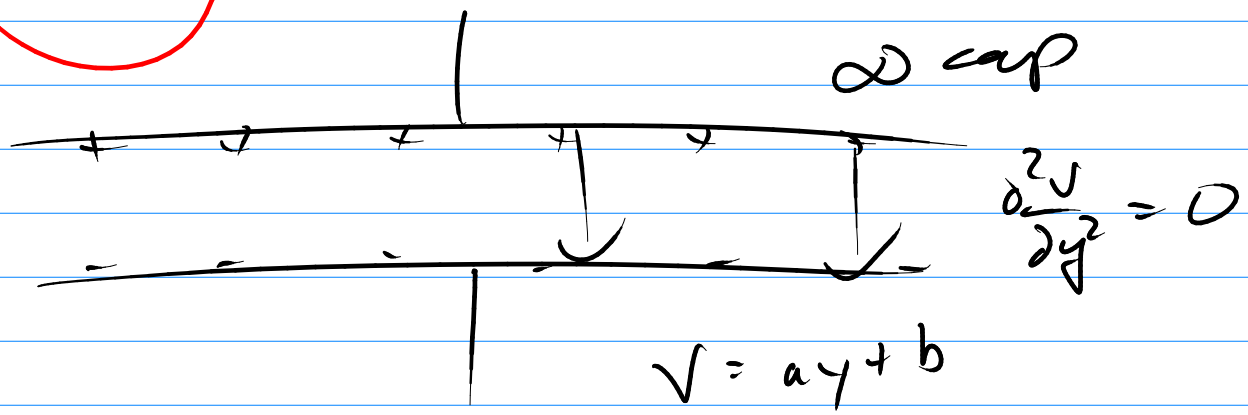
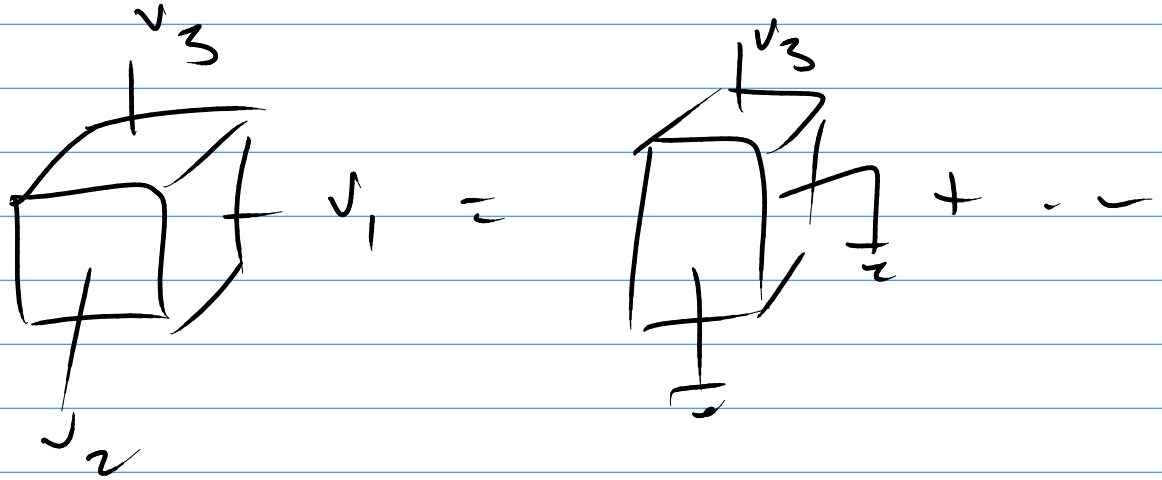
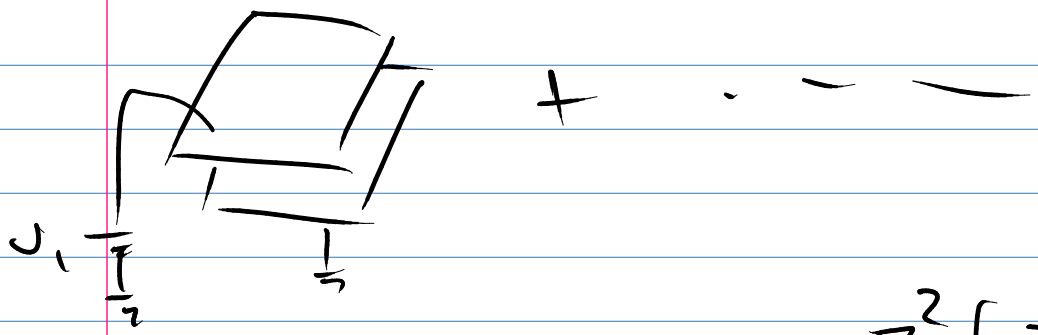


$$\nabla^2 V = 0$$

$$\frac{\partial^2 V}{\partial x^2} + \frac{\partial^2 V}{\partial y^2} + \frac{\partial^2 V}{\partial z^2} = 0$$

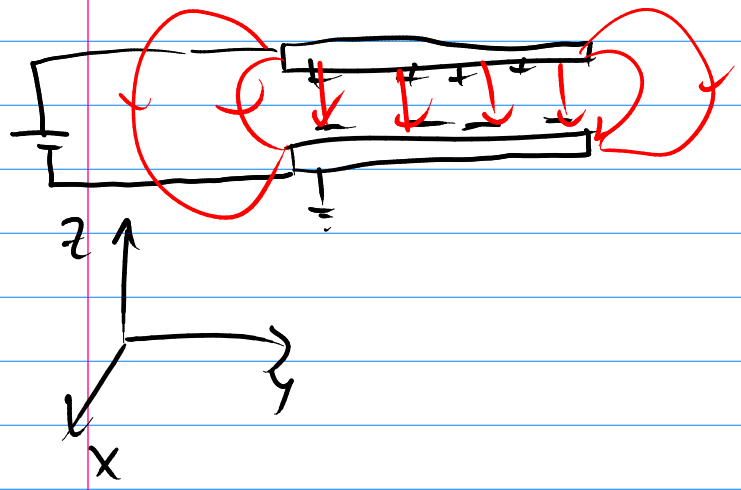


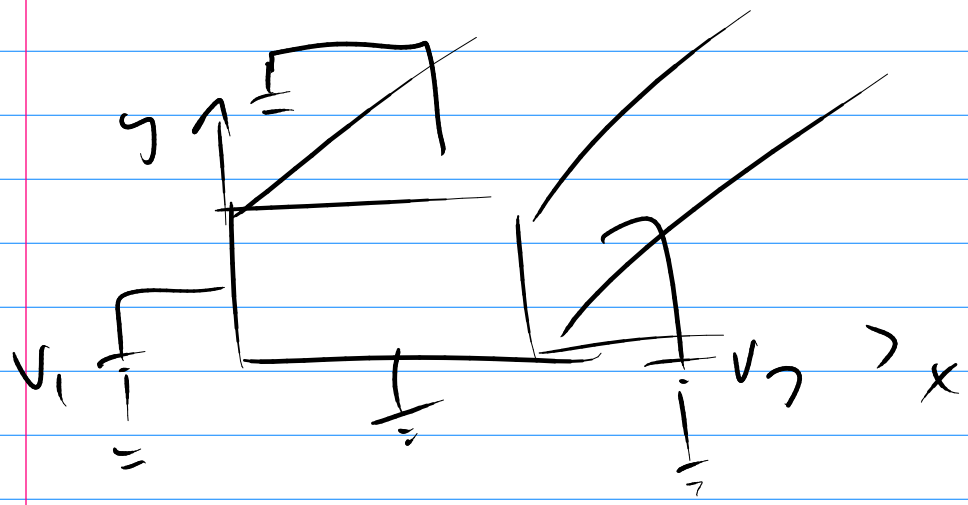


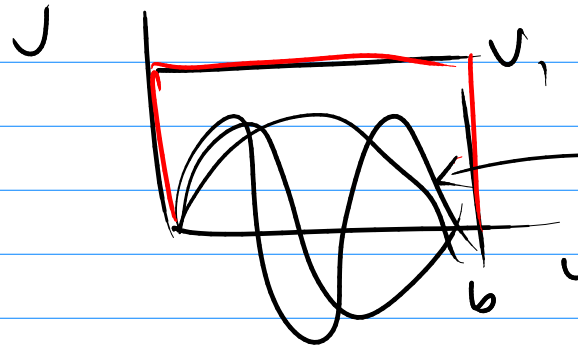


$\nabla^2 V = 0$

- relaxation
- sep variables
- images







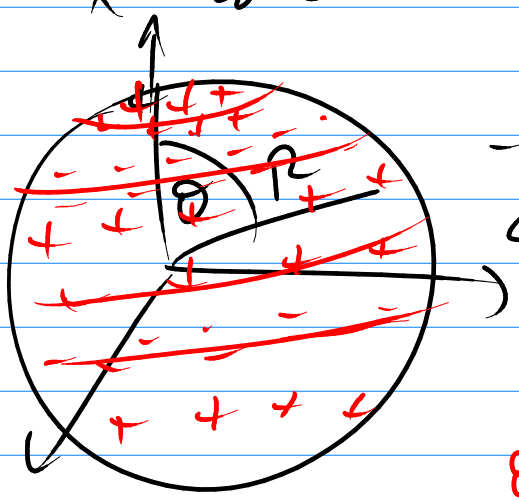
$x = 0$

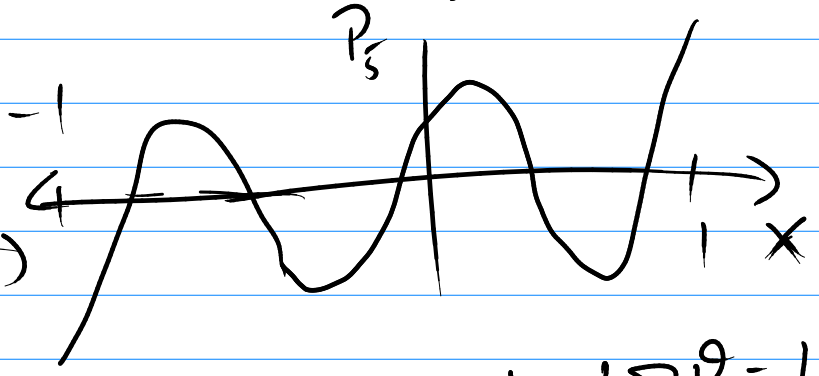
soln to Sch. eqn

$\nabla^2 V = 0$ in sph coords

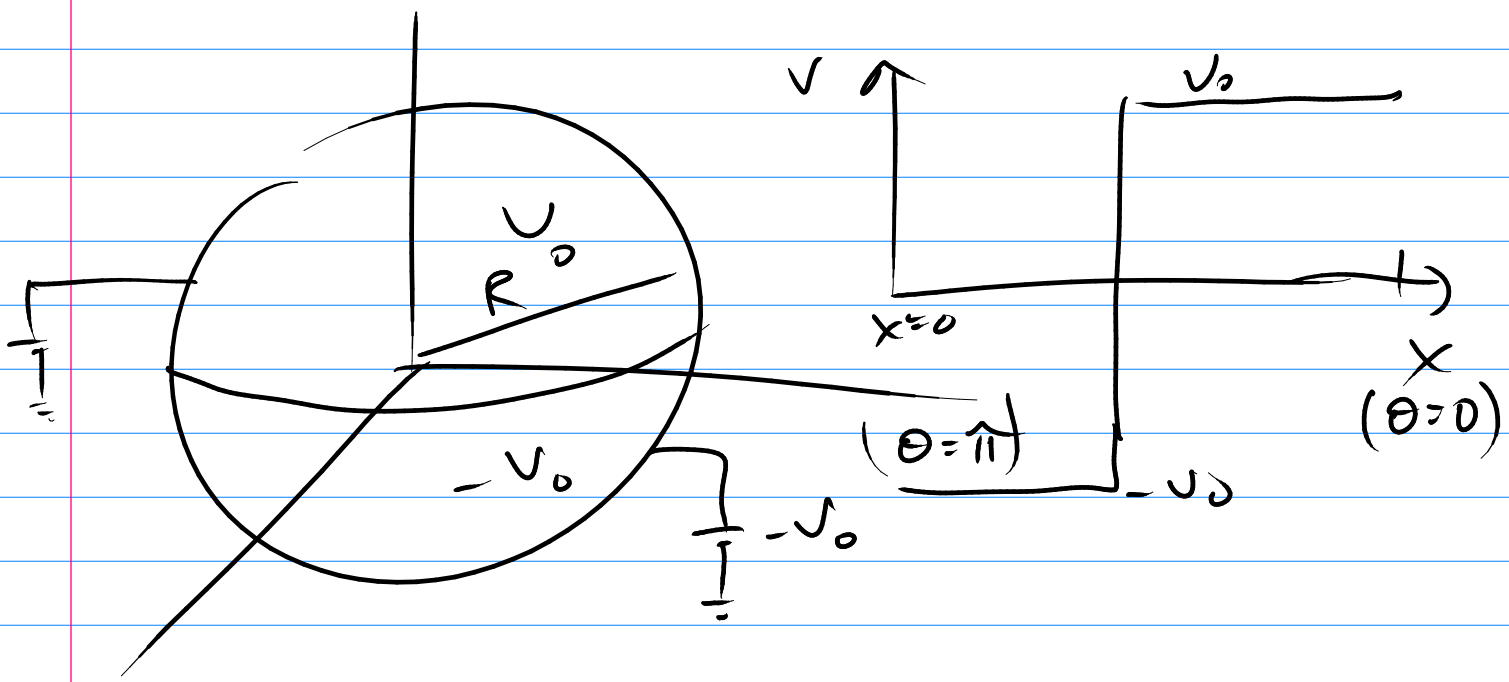
$$V = \sum_{l=0}^{\infty} \left(A_l r^l + B_l r^{-(l+1)} \right) P_l(\cos\theta)$$

$x = \cos\theta$ $\quad r = R$ $\quad l = 5$





$\theta = \pi$ $\quad x = \cos\theta = 1$ $\quad \theta = 0$



$r < R$

$$V = \sum_{\ell=0}^{\infty} \left(A_\ell r^\ell + \cancel{B_\ell r^{-(\ell+1)}} \right) P_\ell(\cos\theta)$$

$\to 0$

evaluate at $r = R$ $\quad V \to$ step function

$\swarrow$ find

$$V_0^{\text{step}} = \sum_\ell A_\ell r^\ell P_\ell(\cos\theta)$$

$$V_0^{\text{step}} P_m(\cos\theta) = \sum_\ell A_\ell R^\ell P_\ell(\cos\theta) P_m(\cos\theta)$$

$$\int V_0^{\text{step}} P_m(\cos\theta)\, d(\cos\theta) = \int \sum_\ell A_\ell R^\ell P_\ell(\cos\theta) P_m(\cos\theta)\, d(\cos\theta)$$