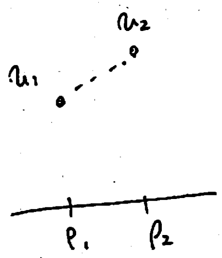
$$u = u_1 + \frac{u_2-u_1}{\rho_2-\rho_1}(\rho-\rho_1)$$



$$V_2-V_1 = \int_{\rho_1}^{\rho_2} u \, d\rho = \left[\left(u_1 - \frac{u_2-u_1}{\rho_2-\rho_1}\rho_1\right)\rho + \frac{u_2-u_1}{\rho_2-\rho_1}\rho^2\right]_{\rho_1}^{\rho_2}$$

$$= u_1(\rho_2-\rho_1) - (u_2-u_1)\rho_1 + (u_2-u_1)(\rho_2+\rho_1)$$

$$= u_1(\cancel{\rho_2}-\cancel{\rho_1}+\cancel{\rho_1}-\cancel{\rho_2}-\rho_1) + u_2(-\rho_1+\rho_2+\rho_1)$$

$$= -u_1\rho_1 + u_2\rho_2$$

$$u_2 = \frac{V_2-V_1+u_1\rho_1}{\rho_2}$$

$$\frac{V_2-V_1+u_1\rho_1}{u_2}$$

$$u = u_1 + \frac{du}{d\rho}(\rho-\rho_1)$$

$$\underbrace{\frac{V_2-V_1}{\Delta V}}_{c} = \int_{\rho_1}^{\rho_2} u \, d\rho = \left[\left(u_1 - \frac{\partial u}{\partial \rho}\rho_1\right)\rho + \frac{\partial u}{\partial \rho}\rho^2\right]_{\rho_1}^{\rho_2}$$

$$= u_1(\rho_2-\rho_1) - \frac{\partial u}{\partial \rho}\rho_1(\rho_2-\cancel{\rho_1}) + \frac{\partial u}{\partial \rho}(\rho_2^2-\cancel{\rho_1^2})$$

$$= \underbrace{\frac{\partial u}{\partial \rho}}_{a}\rho_2^2 + \underbrace{\left(u_1 - \frac{\partial u}{\partial \rho}\rho_1\right)}_{b}\rho_2 - u_1\rho_1$$