$$\varphi = (\psi_1 \dots \psi_n)$$

$$F[\varphi + \alpha\eta] = \int_{t_1}^{t_2} dt' \int d^3r' \mathcal{L}(\psi_\nu + \alpha\eta_\nu, \psi_{\nu|k} + \alpha\eta_{\nu|k}, \dot{\psi}_\nu + \alpha\dot{\eta}_\nu, t)$$

$$\frac{d}{d\alpha} F[\varphi + \alpha\eta]\Big|_{\alpha=0} = \int_{t_1}^{t_2} dt' \int d^3r' \sum_{\nu=1}^{n} \left[\frac{\partial \mathcal{L}}{\partial \psi_\nu} \eta_\nu + \sum_{k=1}^{3} \frac{\partial \mathcal{L}}{\partial \psi_{\nu|k}} \eta_{\nu|k} + \frac{\partial \mathcal{L}}{\partial \dot{\psi}} \dot{\eta}_\nu \right]$$

$$= \int_{t_1}^{t_2} dt' \int d^3r' \sum_{\nu=1}^{n} \left[\frac{\partial \mathcal{L}}{\partial \psi_\nu} \eta_\nu - \sum_{k=1} \frac{\partial}{\partial x_k} \frac{\partial \mathcal{L}}{\partial \psi_{\nu|k}} \eta_\eta - \frac{\partial}{\partial t} \frac{\partial \mathcal{L}}{\partial \dot{\psi}_\nu} \eta_\nu \right]$$

$$H = \int d^3r \, \mathcal{D}(\psi_\nu, \psi_{\nu|k}, \pi_\nu, \pi_{\nu|k}, t)$$

$$\frac{\partial \mathcal{L}}{\partial \dot{\psi}_\nu} = \pi_\nu \quad ; \quad \mathcal{D} = \sum_{\nu=1}^{n} \pi_\nu \dot{\psi}_\nu - \mathcal{L}$$

$$\dot{\pi}_\nu = \frac{\partial \mathcal{L}}{\partial \psi_\nu} - \sum_{k=1}^{3} \frac{\partial}{\partial x_k} \frac{\partial \mathcal{L}}{\partial \psi_{\nu|k}} = -\frac{\partial \mathcal{D}}{\partial \psi_\nu} + \sum_{k=1}^{3} \frac{\partial}{\partial x_k} \frac{\partial \mathcal{D}}{\partial \psi_{\nu|k}}$$

$$\frac{\partial}{\partial x_1} \nabla \cdot \vec{A} = \frac{\partial^2 A_1}{\partial x_1^2} + \frac{\partial^2 A_2}{\partial x_1 \partial x_2} + \frac{\partial^2 A_3}{\partial x_1 \partial x_3}$$