HW 6.1

Monday, February 22, 2021 5:49 PM

$$S = \int d\lambda \left[-g(\lambda)^{-1} \frac{dr}{d\lambda} \cdot \frac{dr}{d\lambda} - \left(\frac{mc}{2}\right)^2 g(\lambda) \right]$$

$$L = \frac{-1}{g(\lambda)} \frac{dr}{d\lambda} \cdot \frac{dr}{d\lambda} - \left(\frac{mc}{2}\right)^2 g(\lambda)$$

$$\frac{d}{d\lambda} \frac{\partial L}{\partial \left(\frac{dr}{d\lambda}\right)} = \frac{\partial L}{\partial \lambda}$$

$$\frac{d}{d\lambda} \frac{\partial}{\partial \left(\frac{dr}{d\lambda}\right)} \left[\frac{-1}{g(\lambda)} \frac{dr}{d\lambda} \cdot \frac{dr}{d\lambda} - \frac{m^2 c^2}{4} g(\lambda) \right]$$

$$= \frac{d}{d\lambda} \left[-\frac{1}{g(\lambda)} \frac{dr}{d\lambda} \right] = g(\lambda)^{-2} \frac{dg(\lambda)}{d\lambda} \frac{dr}{d\lambda} - \frac{1}{g(\lambda)} \frac{d^2 r}{d\lambda^2}$$

$$\frac{\partial L}{\partial \lambda} = + \cdot g(\lambda)^{-2} \frac{dg(\lambda)}{d\lambda} \frac{dr}{d\lambda} \cdot \frac{dr}{d\lambda} - \frac{m^2 c^2}{4} \frac{dg(\lambda)}{d\lambda}$$

$$g(\lambda)^{-2} \frac{dg(\lambda)}{\ } \frac{dr}{\ } - g(\lambda)^{-1} \frac{d^2 r}{\ }$$

$$d\lambda \quad d\lambda \qquad d\lambda^2$$

$$-g(\lambda)^{-2}\frac{dg(\lambda)}{d\lambda}\left(\frac{dr}{d\lambda}\right)^2 - \frac{m^2c^2}{4}\frac{dg(\lambda)}{d\lambda} = 0$$

E.O.M.

$$\frac{d^2r}{d\lambda^2} + \frac{dr}{d\lambda}\left[g(\lambda)^{-1}\frac{dg}{d\lambda}\left(1-\frac{dr}{d\lambda}\right)\right] = \frac{m^2c^2}{4}\frac{dg}{d\lambda}$$