Monday, September 14, 2020 11:39 PM

$$S = \int_{x_1}^{x_2} F(\bar{y}, \bar{y}', x)\, dx$$

$$\bar{y} = y(x) + \alpha \eta(x)$$

$$\bar{y}' = y'(x) + \alpha \eta'(x)$$

$y(x) =$ stationary, $\therefore \alpha = 0$

$\frac{dS}{d\alpha} = 0$, for correct $y(x)$

as $S = S(\alpha)$

$$\frac{dS}{d\alpha} = \int_{x_1}^{x_2} \frac{d}{d\alpha} F(\bar{y}, \bar{y}', x)\, dx$$

$$\frac{dF}{d\alpha} = \frac{dF}{d\bar{y}} \frac{d\bar{y}}{d\alpha} + \frac{dF}{d\bar{y}'} \frac{d\bar{y}'}{d\alpha}$$

$$= \eta \frac{dF}{d\bar{y}} + \eta' \frac{dF}{d\bar{y}'} \quad \text{A}$$

But, Book has

$$= \eta \frac{df}{dy} + \eta' \frac{df}{dy'} \quad \text{B}$$

How do I go from A $\to$ B?

That is, how do I know

$$\boxed{\frac{dF}{d\bar{y}} = \frac{dF}{dy}, \quad \frac{dF}{d\bar{y}'} = \frac{dF}{dy'}}$$