(1) $\boxed{\delta\bar{Q} = \delta Q + \delta\hat{Q}}$

$\delta Q = \lambda\, d\sigma$ adierazpen orokorra

$\bar{\lambda}\, d\bar{\sigma} = \delta\bar{Q} = \lambda\, d\sigma + \hat{\lambda}\, d\hat{\sigma}$

$$\boxed{d\bar{\sigma} = \frac{\lambda}{\bar{\lambda}} d\sigma + \frac{\hat{\lambda}}{\bar{\lambda}} d\hat{\sigma}} \Rightarrow \bar{\sigma} = \bar{\sigma}(\sigma,\hat{\sigma}) \Rightarrow d\bar{\sigma} = \left(\frac{\partial\bar{\sigma}}{\partial\sigma}\right)_{\hat{\sigma}} d\sigma + \left(\frac{\partial\bar{\sigma}}{\partial\hat{\sigma}}\right)_{\sigma} d\hat{\sigma} \Rightarrow \begin{cases} \left(\frac{\partial\bar{\sigma}}{\partial\sigma}\right)_{\hat{\sigma}} = \frac{\lambda}{\bar{\lambda}} = g_1(\sigma,\hat{\sigma}) \\ \left(\frac{\partial\bar{\sigma}}{\partial\hat{\sigma}}\right)_{\sigma} = \frac{\hat{\lambda}}{\bar{\lambda}} = g_2(\sigma,\hat{\sigma}) \end{cases}$$

(2) $\bar{\sigma} = \bar{\sigma}(t,\sigma,\hat{\sigma},X,\hat{X})$

bi hauek alderatu

$$\boxed{d\bar{\sigma} = \left(\frac{\partial\bar{\sigma}}{\partial t}\right)_{\sigma,\hat{\sigma},X,\hat{X}} dt + \left(\frac{\partial\bar{\sigma}}{\partial\sigma}\right)_{t,\hat{\sigma},X,\hat{X}} d\sigma + \left(\frac{\partial\bar{\sigma}}{\partial\hat{\sigma}}\right)_{t,\sigma,X,\hat{X}} d\hat{\sigma} + \left(\frac{\partial\bar{\sigma}}{\partial X}\right)_{t,\sigma,\hat{\sigma},\hat{X}} dX + \left(\frac{\partial\bar{\sigma}}{\partial\hat{X}}\right)_{t,\sigma,\hat{\sigma},X} d\hat{X}} \Rightarrow$$

ondorioz

$$\left(\frac{\partial\bar{\sigma}}{\partial t}\right)_{\sigma,\hat{\sigma},X,\hat{X}} = \left(\frac{\partial\bar{\sigma}}{\partial X}\right)_{t,\sigma,\hat{\sigma},\hat{X}} = \left(\frac{\partial\bar{\sigma}}{\partial\hat{X}}\right)_{t,\sigma,\hat{\sigma},X} = 0$$

$$d\bar{\sigma} = \left(\frac{\partial\bar{\sigma}}{\partial\sigma}\right)_{t,\hat{\sigma},X,\hat{X}} d\sigma + \left(\frac{\partial\bar{\sigma}}{\partial\hat{\sigma}}\right)_{t,\sigma,X,\hat{X}} d\hat{\sigma} \Rightarrow \boxed{\left(\frac{\partial\bar{\sigma}}{\partial\sigma}\right)_{t,\hat{\sigma},X,\hat{X}} = f_1(t,\sigma,\hat{\sigma},X,\hat{X})}\ ; \boxed{\left(\frac{\partial\bar{\sigma}}{\partial\hat{\sigma}}\right)_{t,\sigma,X,\hat{X}} = f_2(t,\sigma,\hat{\sigma},X,\hat{X})}$$

hauek dira alderatuko ditugunak mendekotasunak ezagututa

$$\left.\begin{aligned} \bar{\lambda} &= \bar{\lambda}(t,\sigma,\hat{\sigma},X,\hat{X}) \\ \lambda &= \lambda(t,\sigma,X) \\ \hat{\lambda} &= \hat{\lambda}(t,\hat{\sigma},\hat{X}) \end{aligned}\right\}$$

$$\frac{\lambda}{\bar{\lambda}} = \underbrace{\frac{\lambda(t,\sigma,X)}{\bar{\lambda}(t,\sigma,\hat{\sigma},X,\hat{X})}} = g_1(\sigma,\hat{\sigma}) \qquad \frac{\hat{\lambda}}{\bar{\lambda}} = \underbrace{\frac{\hat{\lambda}(t,\hat{\sigma},\hat{X})}{\bar{\lambda}(t,\sigma,\hat{\sigma},X,\hat{X})}} = g_2(\sigma,\hat{\sigma})$$

$\bar{\lambda}(t,\sigma,\hat{\sigma},X,\hat{X}) \longrightarrow \boxed{\bar{\lambda}(t,\sigma,\hat{\sigma},X)}$

(1) $\boxed{\bar{\lambda}(t,\sigma,\hat{\sigma},X) \longrightarrow \bar{\lambda}(t,\sigma,\hat{\sigma})}$

(2) $\hat{\lambda}(t,\hat{\sigma},\hat{X}) \longrightarrow \hat{\lambda}(t,\hat{\sigma})$

noranzko honetan joan

$\lambda(t,\sigma,X) \longrightarrow \lambda(t,\sigma)$

⇒ alderaketaren ondorioz

$$\boxed{\begin{aligned} \lambda &= \lambda(t,\sigma) \\ \hat{\lambda} &= \hat{\lambda}(t,\hat{\sigma}) \\ \bar{\lambda} &= \bar{\lambda}(t,\sigma,\hat{\sigma}) \end{aligned}}$$

⇓ jarraitu...

$$\frac{\lambda}{\bar{\lambda}} = \frac{\lambda(t,\sigma)}{\bar{\lambda}(t,\sigma,\hat{\sigma})} = g_1(\sigma,\hat{\sigma}) \qquad \frac{\hat{\lambda}}{\bar{\lambda}} = \frac{\hat{\lambda}(t,\hat{\sigma})}{\bar{\lambda}(t,\sigma,\hat{\sigma})} = g_2(\sigma,\hat{\sigma})$$

$$\lambda(t,\sigma) = \phi(t) f_1(\sigma) \qquad \hat{\lambda}(t,\hat{\sigma}) = \phi(t) f_2(\hat{\sigma})$$

$$\bar{\lambda}(t,\sigma,\hat{\sigma}) = \phi(t) f(\sigma,\hat{\sigma}) \qquad \bar{\lambda}(t,\sigma,\hat{\sigma}) = \phi(t) f(\sigma,\hat{\sigma})$$