

$$\begin{aligned}
&= \sum \left\{ \frac{\partial f}{\partial q_i} \frac{\partial}{\partial p_i} \left(\frac{\partial g}{\partial q_k} \frac{\partial h}{\partial p_k} \right) - \frac{\partial f}{\partial q_i} \frac{\partial}{\partial p_i} \left(\frac{\partial g}{\partial p_k} \frac{\partial h}{\partial q_k} \right) - \frac{\partial f}{\partial p_i} \frac{\partial}{\partial q_i} \left(\frac{\partial g}{\partial q_k} \frac{\partial h}{\partial p_k} \right) + \frac{\partial f}{\partial p_i} \frac{\partial}{\partial q_i} \left(\frac{\partial g}{\partial p_k} \frac{\partial h}{\partial q_k} \right) \right\} \\
\therefore \{f\{gh\}\} &= \sum \left\{ - \left(\frac{\partial h}{\partial p_k} \frac{\partial^2 g}{\partial q_i \partial q_k} - \frac{\partial g}{\partial q_k} \frac{\partial^2 h}{\partial q_i \partial p_k} + \frac{\partial h}{\partial q_k} \frac{\partial^2 g}{\partial q_i \partial p_k} + \frac{\partial g}{\partial p_k} \frac{\partial^2 h}{\partial q_i \partial q_k} \right) \frac{\partial f}{\partial p_i} \right. \\
&\quad \left. + \left(\frac{\partial g}{\partial q_k} \frac{\partial^2 h}{\partial p_i \partial p_k} - \frac{\partial g}{\partial p_k} \frac{\partial^2 h}{\partial p_i \partial q_k} - \frac{\partial h}{\partial q_k} \frac{\partial^2 g}{\partial p_i \partial p_k} + \frac{\partial h}{\partial p_k} \frac{\partial^2 g}{\partial p_i \partial q_k} \right) \frac{\partial f}{\partial q_i} \right\} \dots (5.2.3 - 4)
\end{aligned}$$