

$$\begin{aligned}
\frac{\partial^3 u}{\partial x^2 \partial y} &= \frac{\partial}{\partial \xi} \left(\frac{\partial^2 u}{\partial \xi^2} \left(\frac{\partial \xi}{\partial x} \right)^2 + \frac{\partial^2 u}{\partial \eta^2} \left(\frac{\partial \eta}{\partial x} \right)^2 + 2 \frac{\partial^2 u}{\partial \xi \partial \eta} \frac{\partial \xi}{\partial x} \frac{\partial \eta}{\partial x} \right) \frac{\partial \xi}{\partial y} \\
&+ \frac{\partial}{\partial \eta} \left(\frac{\partial^2 u}{\partial \xi^2} \left(\frac{\partial \xi}{\partial x} \right)^2 + \frac{\partial^2 u}{\partial \eta^2} \left(\frac{\partial \eta}{\partial x} \right)^2 + 2 \frac{\partial^2 u}{\partial \xi \partial \eta} \frac{\partial \xi}{\partial x} \frac{\partial \eta}{\partial x} \right) \frac{\partial \eta}{\partial y} \\
&= \frac{\partial^3 u}{\partial \xi^3} \left(\frac{\partial \xi}{\partial x} \right)^2 \frac{\partial \xi}{\partial y} + \frac{\partial^3 u}{\partial \xi \partial \eta^2} \left(\frac{\partial \eta}{\partial x} \right)^2 \frac{\partial \xi}{\partial y} + 2 \frac{\partial^3 u}{\partial \xi^2 \partial \eta} \frac{\partial \xi}{\partial x} \frac{\partial \xi}{\partial y} \frac{\partial \eta}{\partial x} \\
&+ \frac{\partial^3 u}{\partial \xi^2 \partial \eta} \left(\frac{\partial \xi}{\partial x} \right)^2 \frac{\partial \eta}{\partial y} + \frac{\partial^3 u}{\partial \eta^3} \left(\frac{\partial \eta}{\partial x} \right)^2 \frac{\partial \eta}{\partial y} + 2 \frac{\partial^3 u}{\partial \xi \partial \eta^2} \frac{\partial \xi}{\partial x} \frac{\partial \eta}{\partial x} \frac{\partial \eta}{\partial y}
\end{aligned}$$

$$\begin{aligned}
\frac{\partial^3 u}{\partial x \partial y^2} &= \frac{\partial}{\partial \xi} \left(\frac{\partial^2 u}{\partial \xi^2} \left(\frac{\partial \xi}{\partial y} \right)^2 + \frac{\partial^2 u}{\partial \eta^2} \left(\frac{\partial \eta}{\partial y} \right)^2 + 2 \frac{\partial^2 u}{\partial \xi \partial \eta} \frac{\partial \xi}{\partial y} \frac{\partial \eta}{\partial y} \right) \frac{\partial \xi}{\partial x} \\
&+ \frac{\partial}{\partial \eta} \left(\frac{\partial^2 u}{\partial \xi^2} \left(\frac{\partial \xi}{\partial y} \right)^2 + \frac{\partial^2 u}{\partial \eta^2} \left(\frac{\partial \eta}{\partial y} \right)^2 + 2 \frac{\partial^2 u}{\partial \xi \partial \eta} \frac{\partial \xi}{\partial y} \frac{\partial \eta}{\partial y} \right) \frac{\partial \eta}{\partial x} \\
&= \frac{\partial^3 u}{\partial \xi^3} \frac{\partial \xi}{\partial x} \left(\frac{\partial \xi}{\partial y} \right)^2 + \frac{\partial^3 u}{\partial \xi \partial \eta^2} \frac{\partial \xi}{\partial x} \left(\frac{\partial \eta}{\partial y} \right)^2 + 2 \frac{\partial^3 u}{\partial \xi^2 \partial \eta} \frac{\partial \xi}{\partial x} \frac{\partial \xi}{\partial y} \frac{\partial \eta}{\partial y} \\
&+ \frac{\partial^3 u}{\partial \xi^2 \partial \eta} \left(\frac{\partial \xi}{\partial y} \right)^2 \frac{\partial \eta}{\partial x} + \frac{\partial^3 u}{\partial \eta^3} \frac{\partial \eta}{\partial x} \left(\frac{\partial \eta}{\partial y} \right)^2 + 2 \frac{\partial^3 u}{\partial \xi \partial \eta^2} \frac{\partial \xi}{\partial y} \frac{\partial \eta}{\partial x} \frac{\partial \eta}{\partial y}
\end{aligned}$$