

$$\begin{aligned}\lambda Ax &= x \\ x'x &= I\end{aligned}$$

$$\begin{aligned}\frac{\partial \lambda}{\partial p}Ax + \lambda \frac{\partial A}{\partial p}x + \lambda A \frac{\partial x}{\partial p} &= \frac{\partial x}{\partial p} \\ \left(\frac{\partial x}{\partial p}\right)'x + x' \frac{\partial x}{\partial p} &= 0 \\ x' \left(\frac{\partial \lambda}{\partial p}Ax + \lambda \frac{\partial A}{\partial p}x + \lambda A \frac{\partial x}{\partial p}\right) + \\ \left(\frac{\partial \lambda}{\partial p}Ax + \lambda \frac{\partial A}{\partial p}x + \lambda A \frac{\partial x}{\partial p}\right)'x &= 0\end{aligned}$$