

$$\begin{aligned}
\frac{\partial}{\partial u} \frac{\mathbf{y}}{\|\mathbf{y}\|} &= \frac{1}{\|\mathbf{y}\|} \frac{\partial \mathbf{y}}{\partial u} + \mathbf{y} \frac{\partial}{\partial u} (\mathbf{y}^* \mathbf{y})^{-1/2} \\
&= \frac{1}{\|\mathbf{y}\|} \frac{\partial \mathbf{y}}{\partial u} - \frac{1}{2} \mathbf{y} (\mathbf{y}^* \mathbf{y})^{-3/2} \frac{\partial}{\partial u} (\mathbf{y}^* \mathbf{y}) \\
&= \frac{1}{\|\mathbf{y}\|} \frac{\partial \mathbf{y}}{\partial u} - \frac{1}{2} \mathbf{y} (\mathbf{y}^* \mathbf{y})^{-3/2} 2 \mathbf{y}^* \frac{\partial \mathbf{y}}{\partial u} \\
&= \frac{1}{\|\mathbf{y}\|} \frac{\partial \mathbf{y}}{\partial u} - \frac{\mathbf{y}}{\|\mathbf{y}\|^3} \mathbf{y}^* \frac{\partial \mathbf{y}}{\partial u}
\end{aligned}$$