$$\nabla J = \boxed{\lambda^T H_v} + J_v \qquad \begin{array}{c} \cancel{O(|x||v|)} \\ O(|v|D_v) \end{array}$$

$$\boxed{H_x^T \lambda = -J_x} \qquad \begin{array}{c} \cancel{O(|x|^3)} \\ O(|x|D_x) \end{array}$$