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1 LTE of the implicit Euler method

We can calculate the LTE e_j as follows

$$\begin{aligned} e_j &= y(t_j) - y(t_{j-1}) - hf(t_j, y(t_j)) \\ &= y(t_j) - (y(t_j) - h\dot{y}(t_j) + \mathcal{O}(h^2)) - hf(t_j, y(t_j)) \\ &= \mathcal{O}(h^2) \end{aligned}$$

since $\dot{y}(t_j) = f(t_j, y(t_j))$ in an ODE.