

► suppose $j > k$

$$\begin{aligned} \ell_j(x^k) &= \frac{d^j}{dx^j} x^k \Big|_{x=0} \\ &= \frac{k(k-1) \dots (1)(0)}{j!} \\ &= 0 \end{aligned}$$

► suppose $j < k$

$$\begin{aligned} \ell_j(x^k) &= \frac{d^j}{dx^j} x^k \Big|_{x=0} \\ &= \frac{k(k-1) \dots (k-j+1) x^{k-j} \Big|_{x=0}}{j!} \\ &= \frac{k(k-1) \dots (k-j+1) 0}{j!} \\ &= 0 \end{aligned}$$