- suppose $j > k$

$$\ell_j[x^k] = \frac{d^j}{dx^j} x^k \Big|_{x=0}$$

$$= \frac{k(k-1)\cdots(1)(0)}{j!}$$

$$= 0$$

- suppose $j < k$

$$\ell_j[x^k] = \frac{\frac{d^j}{dx^j} x^k \Big|_{x=0}}{j!}$$

$$= \frac{k(k-1)\cdots(k-j+1)\, x^{k-j} \Big|_{x=0}}{j!}$$

$$= \frac{k(k-1)\cdots(k-j+1)\, 0}{j!}$$

$$= 0$$