Proof

- Need to show that

$$\varphi_j(x^k) = \begin{cases} 1 & \text{if } j = k \\ 0 & \text{if } j \neq k \end{cases}$$

- Suppose $j = k$

$$\varphi_j(x^k) = \frac{\frac{d^j}{dx^j} x^k \Big|_{x=0}}{j!} = \frac{\frac{d^j}{dx^j} x^j \Big|_{x=0}}{j!}$$

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

$$= \frac{j!}{j!} = 1$$