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# A note on Hermite interpolation

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**Abstract**

Let $x_0, x_1, \dots, x_n \in \mathbb{R}$, be pairwise disjoint, and let $\theta_0, \theta_1, \dots, \theta_n \in \mathbb{N}$. Set $\theta := \sum_{\nu=0}^{n} \theta_\nu$. For each pair $j, p$ such that $0 \le j \le n$ and $0 \le p \le \theta_j - 1$, let $y_{j,p}$ be a complex number. Then there is a unique polynomial, $H(x)$, of degree $\theta - 1$, such that

$$H^{(p)}(x_j) = y_{j,p}, \quad \text{for} \quad 0 \le p \le \theta_j - 1, \quad 0 \le j \le n.$$

In particular, there is a unique fundamental Hermite polynomial, $T_{j,p}(x)$, of degree $\theta - 1$, such that

$$T_{j,p}^{(r)}(x_s) = \delta_{j,s}\delta_{p,r}, \quad 0 \le r \le \theta_s - 1, \quad 0 \le s \le n,$$

$\delta$ being Kronecker's delta, and we have the representation

$$H(x) = \sum_{\substack{0 \le p \le \theta_j, \\ 0 \le j \le n}} H^{(p)}(x_j) T_{j,p}(x) = \sum_{\substack{0 \le p \le \theta_j, \\ 0 \le j \le n}} y_{j,p} T_{j,p}(x).$$

We give an explicit representation of the polynomials $T_{j,p}(x)$.

**Keywords:** Hermite interpolation, explicit representation of the fundamental polynomials.

**MSC:** 41A05, 41A10.