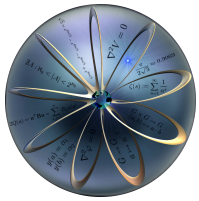

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# proof of uniqueness of Lagrange Interpolation formula

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Existence is clear from the construction, the uniqueness is proved by assuming there are two different polynomials $p(x)$ and $q(x)$ that interpolate the points. Then $r(x) = p(x) - q(x)$ has $n$ zeros, $x_1, \ldots, x_n$ and there is a point $x_e$ such that $r(x_e) \neq 0$. $r(x)$ is non-constant with degree $\deg(r(x)) \leq n - 1$ and has more than $n - 1$ solutions, which is a contradiction. Thus there can only be one polynomial.