Proof

a) Independence:

let $0 = a_0(1) + a_1(x-5) + \cdots + a_m(x-5)^m$

→ Since LHS has no x^m, but RHS has one x^m term,

$a_m = 0$.

→ Since LHS has no x^{m-1}, but RHS has one x^{m-1} term,

$a_{m-1} = 0$

→ Proceed; the same way, and we'll obtain

$a_0 = a_1 = \cdots = a_m = 0$.

Since $\dim \mathcal{P}_m(\mathbb{R}) = m+1$,

and the list above has length $m+1$,

it is a basis. (by 2.39 Axler).