Assignment/Problem Set 11

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1 Exercise 3

We need to obtain a formula for the polynomial p of least degree:

$$p(x_i) = y_i p'(x_i) = 0$$

We have a polynomial of degree $\leq 2n+1$:

$$p_{2n+1}(x) = \sum_{i=0}^{n} y_i H_i(x) + \sum_{i=0}^{n} p'(x_i)\hat{H}_i(x) = \sum_{i=0}^{n} y_i H_i(x)$$

2 Exercise 6

We need only to verify that if $p(x_i) = c_{i0}$, $p'(x_i) = c_{i1}$.

$$p(x) = \sum_{i=0}^{n} c_{i0} A_i(x) + \sum_{i=0}^{n} c_{i1} B_i(x)$$
$$p(x) = \sum_{i=0}^{n} c_{i0} A_i(x) + c_{i1} B_i(x)$$
$$p(x) = \sum_{i=0}^{n} c_{i0} \sum_{j=0}^{n} A_i(x_j) + c_{i1} \sum_{j=0}^{n} B_i(x_j)$$

So for the case that $p(x_i) = c_{i0}$, we need to remove the B_i term in the summation, meaning we set $B_i(x_j) = 0$, since our constraint is $p(x_i) = c_{i0}$, $A_i(x_j)$ must be 1 if $i = j$:

$$p(x) = \sum_{i=0}^{n} c_{i0} A_i(x_j) = \sum_{i=0}^{n} c_{i0} \delta_{ij}$$

For the other case that $p'(x_i) = c_{i1}$, we analogically need that A_i is zero, so that $B'_i(x_j) = \delta_{ij}$

$$p'(x) = \sum_{i=0}^{n} c_{i1} \sum_{j=0}^{n} B'_i(x_j) = \sum_{i=0}^{n} c_{i1} \delta_{ij}$$