1. Consider the Hermite problem
   \[ p^{(r)}(x_i) = y_i^{(r)}, \quad i=1,2; \quad r=0,1,2 \]
   With \( p(x) \) a polynomial of degree \( \leq 5 \).
   (a) Give a Lagrange type of formula for \( p(x) \). *(Hint: For the basis functions sat. \( l(x_0) = l'(x_2) = l''(x_2) = 0 \), use \( l(x) = (x-x_2)^3 g(x) \), with \( g(x) \) of degree \( \leq 2 \). Find \( g(x) \).*
   (b) Give a Newton divided difference formula.
   (c) Derive an error formula.

2. Consider calculating a cubic interpolating spline with the additional boundary conditions \( S''(x_0) = 0 \) and \( S''(x_n) = 0 \). Show that
   \[ \int_{x_0}^{x_n} [S''(x)]^2 \, dx \leq \int_{x_0}^{x_n} [g''(x)]^2 \, dx \]
   for any \( g \in C^2[x_0, x_n] \) that sat. the interpolating conditions \( g(x_i) = y_i \), \( i = 0,1,\ldots,n \). Explain why this smooth natural cubic interpolating spline converges slowly near the endpoints.

3. Derive a formula for calculating a cubic interpolating spline with the "not-a-knot" condition.