Lab 5

Hermite interpolation

1. In the following table there are some data regarding a moving car. Use Hermite interpolation to estimate position and speed of the car when the time is $t = 10$.

Time	0	3	5	8	13
Distance	0	225	383	623	993
Speed	75	77	80	74	72

2. With $f(x) = \ln x$, calculate $f(1.5)$ by cubic interpolation, using $f(1) = 0$, $f(2) = 0.6931$, $f'(1) = 1$, $f'(2) = 0.5$.

3. Plot, in the same figure, the graphs of the function $f : [-5, 5] \to \mathbb{R}$, $f(x) = \sin 2x$ and of the corresponding Hermite interpolation polynomial, considering 15 equidistant nodes in $[-5, 5]$.

Facultative:

3. The data from the following table are generated using the function $f(x) = x \ln x$:

x	$f(x)$	$f\prime(x)$
8.3	17.56492	3.116256
8.6	18.50515	3.151762

Use the Hermite interpolation polynomial to approximate $f(8.4)$ and find the absolute error.

4. Let $f(x) = 3xe^x - e^{2x}$.

a) Approximate $f(1.03)$ by the Hermite interpolation polynomial of degree at most three, using $x_0 = 1$ and $x_1 = 1.05$ and find the absolute error.

b) Repeat (a) with the Hermite interpolation polynomial of degree at most five, using $x_0 = 1$ and $x_1 = 1.05$ and $x_2 = 1.07$ and find the absolute error.

c) Plot the graphs of the function f and of the interpolation polynomials from (a) and (b).