

Exercises 2(a), 2(c) and 3 are to be handed in on Thursday, 23.12.2010, before the lecture.

Exercise 1 (Cubic Spline Interpolation)

Use the data of exercise 1 on Exercise Sheet 7 and perform polynomial, piecewise linear and cubic spline interpolation (here: use the not-a-knot condition). Plot your results.

Once more the data:

Time	10 am	12 pm	2 pm	4 pm	6 pm
Relative Humidity	84%	91%	75%	68%	77%

Use the Matlab function *spline* for the cubic spline interpolation (type „*help spline*“ to view the documentation of the function *spline*).

Exercise 2 (FFT)

- (a) Given a T -periodic function f . Reformulate f as a 2π -periodic function \tilde{f} by linear transformation.
- (b) A measurement of the blood flow-rate in a cross-section of the carotid artery during a heart beat shows the following values:

time in ms	0	100	200	300	400	500	600	700	800	900
flow-rate	0	35	0.125	5	0	5	1	0.5	0.125	0

Use the FFT to interpolate these data (the Matlab function *fft(y)* divided by the number of nodes n gives the coefficients c_j in the interpolating trigonometric polynomial).

- (c) Plot your results and compare them to polynomial interpolation.

Exercise 3 (Chebyshev interpolation)

- (a) Prove that the Chebyshev nodes are the zeros of the Chebyshev polynomial $T_n(x) = \cos(n \arccos(x))$.
- (b) T_n is a polynomial of degree n .
Find the coefficients of T_5 using polynomial interpolation!