Introduction to Computational Physics

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(To be discussed on Friday, 6.6. and Tuesday, 10.6.)

EXERCISE 4.1: **Cubic Spline Interpolation**

The FORTRAN implementation of this exercise can be found in my program `Ex4.1.f`. I have already improved the algorithm according to the second posed problem by adding an additional argument to `splint`. `Ex4.1.f` writes a file `result.dat` which contains the interpolated function. A plot of both data sets can be found in `spline.ps`. At the given scale they are not distinguishable, but as a further exercise it may be interesting to have a look at close ups of both functions.

EXERCISE 4.2: **Linear χ^2 fit**

The FORTRAN implementation of this exercise can be found in my program `Ex4.2.f`. The program returns all required parameters and in addition I have already added the calculation of the correlation coefficient r_{ab}. It also writes a table of the resulting fit function into `fitout.dat`. The data where produced by simulating $f(x) = \sin(x/3)+1/\pi$ with some Gaussian fluctuations. (In one of the next lectures, I intend to come back to that exercise to see if one can also fit the x^3 term of the sine. But it turns out that with the given errors, its zero within 1σ.) If one performs the fit without using the information on the errors, one obtains very similar fit parameters, since the variation of the uncertainties is not too large. (Of course, in this case the χ^2 has no meaning.) In the plot `linearfit.ps`, I show the data, the fit line (black) and the exact function $f(x)$ (red). Here, again one sees that with the given uncertainties, the exact and the fit function are hardly distinguishable.