



Numerical Analysis I (3rd Practical Homework Assignment)

Practical Exercise 3 (*Linear Least Squares Problem*)

Write a code which implements the linear least squares problem associated with polynomial approximation (cf. Exercise 18, 5th Homework Assignment) for $m = 2^k$, $k \in \{K_1, \dots, K_2\}$, and $n = 2^{K_1}$. The input data are the parameters K_1, K_2 and the function f . The output data are the solution vectors $x^{(m)}$ with m as above.

The doubling of m means the incorporation of m additional conditions. These additional conditions should be added sequentially by using the technique of updating as described in Exercise 19 of the 5th Homework Assignment.

The delivery is a table containing the output data for $K_1 = 3$, $K_2 = 20$ and $f(x) = \sqrt{x}$.

For your control:

m	solution vector $x^{(m)}$								
8	0.0000	4.8527	-24.3118	82.8453	-165.5651	189.7227	-115.3446	28.8009	
16	0.0019	5.4852	-33.1230	128.0295	-278.9052	339.2547	-215.0103	55.2682	
32	0.0123	5.4496	-34.1508	136.3590	-304.4484	377.4443	-242.8991	63.2366	
64	0.0294	4.9875	-29.9577	118.5297	-264.3041	328.1853	-211.7980	55.3330	
128	0.0440	4.5384	-25.5717	98.8513	-218.0266	269.2075	-173.2449	45.2068	
256	0.0532	4.2526	-22.7415	86.0161	-187.5582	230.0411	-147.4309	38.3722	
512	0.0581	4.0998	-21.2240	79.1135	-171.1244	208.8540	-133.4259	34.6532	
1024	0.0605	4.0239	-20.4700	75.6808	-162.9442	198.2972	-126.4404	32.7963	
2048	0.0616	3.9872	-20.1053	74.0208	-158.9878	193.1902	-123.0603	31.8975	
4096	0.0622	3.9696	-19.9300	73.2227	-157.0858	190.7353	-121.4355	31.4654	
8192	0.0625	3.9611	-19.8454	72.8376	-156.1684	189.5514	-120.6521	31.2571	
16384	0.0626	3.9569	-19.8043	72.6507	-155.7232	188.9770	-120.2720	31.1561	
32768	0.0627	3.9549	-19.7842	72.5594	-155.5057	188.6964	-120.0864	31.1068	
65536	0.0627	3.9539	-19.7744	72.5146	-155.3988	188.5586	-119.9952	31.0826	
131072	0.0627	3.9534	-19.7695	72.4924	-155.3461	188.4905	-119.9502	31.0706	
262144	0.0627	3.9532	-19.7671	72.4814	-155.3200	188.4569	-119.9279	31.0647	
524288	0.0627	3.9531	-19.7659	72.4760	-155.3070	188.4401	-119.9169	31.0617	