Problem 1 (Σ 20 pts)

- printout of code
- no comments in code: (−3 pts)
- not uploaded to SafeAssign: (−10 pts)
- no printout (−10 pts)

Problem 2: (Σ 60 pts)

a.) left boundary: $f'_0 = \frac{f_1 - f_0}{h}$ (1)

inside: $f'_i = \frac{f_{i+1} - f_{i-1}}{2h}$ (1)

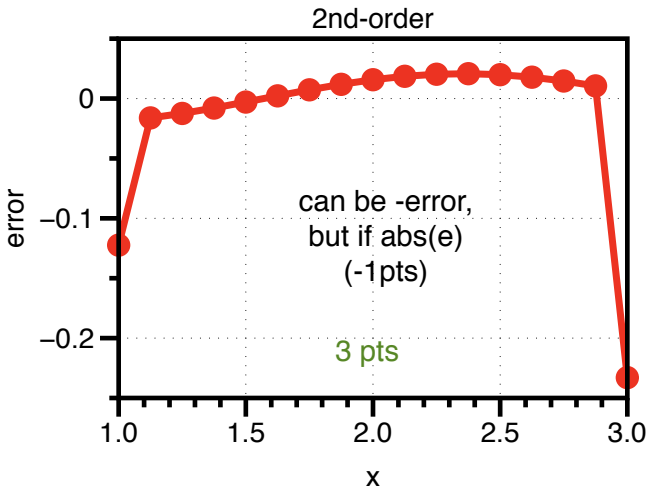
right boundary: $f'_n = \frac{f_n - f_{n-1}}{h}$ (1)

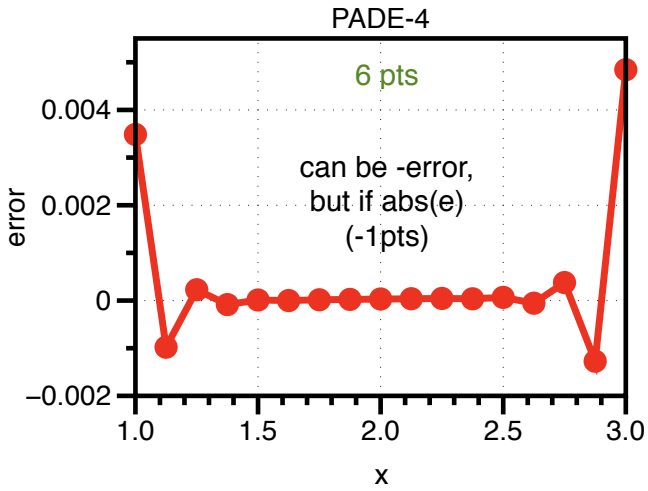
b.) left boundary: $f'_0 + 2f'_1 = \frac{1}{h}\left(-\frac{5}{2}f_0 + 2f_1 + \frac{1}{2}f_2\right)$ (1)

inside: $f'_{i-1} + 4f'_i + f'_{i+1} = \frac{3}{h}\left(f_{i+1} - f_{i-1}\right)$ (1)

right boundary: $2f'_{n-1} + f'_n = \frac{1}{h}\left(\frac{5}{2}f_n - 2f_{n-1} - \frac{1}{2}f_{n-2}\right)$ (1)

Code: 18 pts





2nd order

	1 pt	1 pt	1 pt	1 pt	1 pt	1 pt
M	**Loo**	**L1**	**L2**	**order Loo**	**order L1**	**order L2**
4	7.94185E-01	4.10763E-01	4.96560E-01			
8	4.47171E-01	1.21692E-01	1.82857E-01	0.82865	1.75507	1.44125
16	2.32992E-01	3.26000E-02	6.53000E-02	0.94055	1.89940	1.48620
32	1.18411E-01	8.42000E-03	2.31000E-02	0.97648	1.95390	1.49715
64	5.96000E-02	2.14000E-03	8.18000E-03	0.98976	1.97695	1.49960
128	2.99000E-02	5.39000E-04	2.89000E-03	0.99525	1.98878	1.50006
256	1.50000E-02	1.35000E-04	1.02000E-03	0.99772	1.99446	1.50010
512	7.50000E-03	3.39000E-05	3.61000E-04	0.99888	1.99723	1.50006
1024	3.75000E-03	8.48000E-06	1.28000E-04	0.99945	1.99862	1.50004

PADE 4th order

	2 pts	2 pts	2 pts	2 pts	2 pts	2 pts
M	**Loo**	**L1**	**L2**	**order Loo**	**order L1**	**order L2**
4	3.53363E-01	1.32478E-01	1.76538E-01	0.000	0.000	0.000
8	3.53000E-02	1.03000E-02	1.65000E-02	3.32252	3.69079	3.41803
16	4.84000E-03	6.82000E-04	1.50000E-03	2.86614	3.91036	3.45789
32	6.45000E-04	4.30000E-05	1.34000E-04	2.91002	3.98653	3.48749
64	8.25000E-05	2.69000E-06	1.19000E-05	2.96516	4.00002	3.49579
128	1.04000E-05	1.68000E-07	1.05000E-06	2.98497	4.00111	3.49838
256	1.31000E-06	1.05000E-08	9.30000E-08	2.99307	4.00122	3.49930
512	1.64000E-07	6.55000E-10	8.22000E-09	2.99668	4.00076	3.49968
1024	2.05000E-08	4.10000E-11	7.26000E-10	2.99838	4.00030	3.49985

- the infinity-norm is only 1st respective 3rd order, since it measures the lowest order of convergence, thus here the boundary treatment (3 pts)
- the one-norm represents the average error and since the number of 1st, respective 3rd order points stays at 2 whereas the number of 2nd order, respective 4th order points increases, the average error tends to the formal order, i.e. 2, respective 4. (3 pts)
- the two-norm sees both contributions due to the square weighting and thus is in-between (3 pts)