Num. Methods in CAE – WS 12/13 – Short solutions

Exercise 1 (20 points):

(a) $det(\mathbf{A}) \neq 0$

(b) $\mathbf{A}$ is strictly row diagonal dominant

(c) $\boldsymbol{x}^{(1)} = (0, -0.5, 1.25)$

(d) $n = 40$

Exercise 2 (6 points):

(a) $(x_1, y_1) = (-1.5, 0)\,;$ **(b)** no

Exercise 3 (9 points):

(a) $a_k = \begin{cases} \frac{2}{\pi k^2}\,, & k \text{ odd}, \\ 0\,, & k \text{ even}; \end{cases}$ $b_k = \begin{cases} \frac{1}{k}\,, & k \text{ odd}, \\ -\frac{1}{k}\,, & k \text{ even}. \end{cases}$

(b) $T_f(t) = 1 + \frac{2}{\pi}\cos(\pi t) + \sin(\pi t) - \frac{1}{2}\sin(2\pi t) + \frac{2}{9\pi}\cos(3\pi t) + \frac{1}{3}\sin(3\pi t) \pm \ldots$

(c) f has mean value 1, it is neither even nor odd, and it is not continuous.

Exercise 4 (15 points):

(a) $p_3(t) = 1 + t - t^2 + \frac{5}{3}t^3$

(b) $w_1 = 1 + \frac{h}{(1 + h/2)^2}$

(c) $\tilde{p}_3(h) = 1 + h - h^2 + \frac{3}{4}\,h^3$