

Technische Numerik

31.

$k$	$x_k$	$ x_k - 3 $	eoc
0	9.0000000000	6.000000e+00	–
1	5.0000000000	2.000000e+00	–
2	3.4000000000	4.000000e-01	1.46
3	3.0235294118	2.352941e-02	1.76
4	3.0000915541	9.155413e-05	1.96
5	3.0000000014	1.396984e-09	2.00

32. Man betrachte die Funktion  $f: [1, 4] \rightarrow \mathbb{R}$  mit  $f(x) = x^2 - 4$ .

- Bisektionsverfahren:

$k$	$x_k$	$ x_k - 2 $	eoc
0	2.5000000000	5.000000e-01	–
1	1.7500000000	2.500000e-01	–
2	2.1250000000	1.250000e-01	1.00
3	1.9375000000	6.250000e-02	1.00
4	2.0312500000	3.125000e-02	1.00
5	1.9843750000	1.562500e-02	1.00
6	2.0078125000	7.812500e-03	1.00
7	1.9960937500	3.906250e-03	1.00
8	2.0019531250	1.953125e-03	1.00

- Sekanten-Methode:

$k$	$x_k$	$ x_k - 2 $	eoc
0	1.0000000000	1.000000e+00	–
1	4.0000000000	2.000000e+00	–
2	1.6000000000	4.000000e-01	-2.32
3	1.8571428571	1.428571e-01	0.64
4	2.0165289256	1.652893e-02	2.09
5	1.9993904297	6.095703e-04	1.53
6	1.9999974911	2.508900e-06	1.66
7	2.0000000004	3.823963e-10	1.60
8	2.0000000000	2.220446e-16	1.63

- Newton-Verfahren:

$k$	$x_k$	$ x_k - 2 $	eoc
0	1.0000000000	1.000000e+00	–
1	2.5000000000	5.000000e-01	–
2	2.0500000000	5.000000e-02	3.32
3	2.0006097561	6.097561e-04	1.91
4	2.0000000929	9.292229e-08	1.99
5	2.0000000000	2.220446e-15	2.00

**33.** Man betrachte die Funktion  $\Phi: [0, 1] \rightarrow [0, 1]$  mit  $\Phi(x) = \cos(x)$ , welche den Fixpunkt  $\bar{x} \approx 0.7390851332151607$  hat.

$k$	$x_k$	$ x_k - 0.7390851332151607 $	eoc
0	0.5000000000	2.390851e-01	–
1	0.8775825619	1.384974e-01	–
2	0.6390124942	1.000726e-01	0.60
3	0.8026851007	6.359997e-02	1.39
4	0.6947780268	4.430711e-02	0.80
5	0.7681958313	2.911070e-02	1.16
6	0.7191654459	1.991969e-02	0.90
7	0.7523557594	1.327063e-02	1.07
8	0.7300810631	9.004070e-03	0.95
9	0.7451203414	6.035208e-03	1.03
10	0.7350063090	4.078824e-03	0.98
11	0.7418265226	2.741389e-03	1.01
12	0.7372357254	1.849408e-03	0.99
13	0.7403296519	1.244519e-03	1.01
14	0.7382462383	8.388949e-04	1.00
15	0.7396499628	5.648296e-04	1.00
16	0.7387045394	3.805939e-04	1.00
17	0.7393414523	2.563191e-04	1.00
18	0.7389124493	1.726839e-04	1.00
19	0.7392014441	1.163109e-04	1.00
20	0.7390067798	7.835343e-05	1.00