

simulazioneQR (svolta a lezione)

Costruzione matrice con autovalori distinti λ in $\{1, 2, \dots, n\}$

9.7523e-01 8.0848e-01 1.0750e+00 1.0919e+00 1.5854e+00
-2.4191e-01 6.6391e+00 -1.7487e+00 1.1474e+01 -9.7116e-01
5.5848e-01 -3.1424e+00 4.5647e+00 -1.0800e+01 2.8928e+00
-5.5535e-03 -1.1472e+00 6.2685e-01 -1.0646e+00 6.4233e-01
2.1691e+00 -1.7439e+00 -4.0562e-01 -5.3982e+00 3.8855e+00

Riduzione in forma di Hessenberg superiore

Matrice originaria: $H_0 = A$

9.7523e-01 8.0848e-01 1.0750e+00 1.0919e+00 1.5854e+00
-2.4191e-01 6.6391e+00 -1.7487e+00 1.1474e+01 -9.7116e-01
5.5848e-01 -3.1424e+00 4.5647e+00 -1.0800e+01 2.8928e+00
-5.5535e-03 -1.1472e+00 6.2685e-01 -1.0646e+00 6.4233e-01
2.1691e+00 -1.7439e+00 -4.0562e-01 -5.3982e+00 3.8855e+00

$G \cdot H_0$

9.7523e-01 8.0848e-01 1.0750e+00 1.0919e+00 1.5854e+00
-2.4191e-01 6.6391e+00 -1.7487e+00 1.1474e+01 -9.7116e-01
5.5848e-01 -3.1424e+00 4.5647e+00 -1.0800e+01 2.8928e+00
-2.1691e+00 1.7410e+00 4.0722e-01 5.3955e+00 -3.8839e+00
0 -1.1517e+00 6.2581e-01 -1.0784e+00 6.5228e-01

$H_1 = G \cdot H_0 \cdot G^t$

9.7523e-01 8.0848e-01 1.0750e+00 -1.5826e+00 1.0960e+00
-2.4191e-01 6.6391e+00 -1.7487e+00 1.0005e+00 1.1472e+01
5.5848e-01 -3.1424e+00 4.5647e+00 -2.9205e+00 -1.0792e+01
-2.1691e+00 1.7410e+00 4.0722e-01 3.8977e+00 5.3855e+00
0 -1.1517e+00 6.2581e-01 -6.5504e-01 -1.0767e+00

$G \cdot H_1$

9.7523e-01 8.0848e-01 1.0750e+00 -1.5826e+00 1.0960e+00
-2.4191e-01 6.6391e+00 -1.7487e+00 1.0005e+00 1.1472e+01
2.2398e+00 -2.4695e+00 7.4381e-01 -4.5028e+00 -7.9064e+00
0 -2.6091e+00 4.5221e+00 -1.8564e+00 -9.1085e+00
0 -1.1517e+00 6.2581e-01 -6.5504e-01 -1.0767e+00

$H_2 = G \cdot H_1 \cdot G^t$

9.7523e-01 8.0848e-01 1.8007e+00 6.4640e-01 1.0960e+00
-2.4191e-01 6.6391e+00 -1.4050e+00 -1.4440e+00 1.1472e+01
2.2398e+00 -2.4695e+00 4.5460e+00 -4.0241e-01 -7.9064e+00
0 -2.6091e+00 2.9253e+00 3.9164e+00 -9.1085e+00
0 -1.1517e+00 7.9039e-01 4.4271e-01 -1.0767e+00

$G \cdot H_2$

9.7523e-01 8.0848e-01 1.8007e+00 6.4640e-01 1.0960e+00

-2.2528e+00	3.1682e+00	-4.6706e+00	2.4503e-01	9.0925e+00
0	6.3355e+00	-9.0867e-01	-1.4788e+00	1.0557e+01
0	-2.6091e+00	2.9253e+00	3.9164e+00	-9.1085e+00
0	-1.1517e+00	7.9039e-01	4.4271e-01	-1.0767e+00

H_3 = G*H_2*Gt

9.7523e-01	-1.7035e+00	9.9716e-01	6.4640e-01	1.0960e+00
-2.2528e+00	4.9838e+00	2.6483e+00	2.4503e-01	9.0925e+00
0	1.5837e+00	6.2013e+00	-1.4788e+00	1.0557e+01
0	-3.1886e+00	-2.2799e+00	3.9164e+00	-9.1085e+00
0	-9.0949e-01	-1.0602e+00	4.4271e-01	-1.0767e+00

G*H_3

9.7523e-01	-1.7035e+00	9.9716e-01	6.4640e-01	1.0960e+00
-2.2528e+00	4.9838e+00	2.6483e+00	2.4503e-01	9.0925e+00
0	1.5837e+00	6.2013e+00	-1.4788e+00	1.0557e+01
0	-3.3157e+00	-2.4832e+00	3.8876e+00	-9.0545e+00
0	-1.1102e-16	-3.9413e-01	-6.4851e-01	1.4630e+00

H_4 = G*H_3*Gt

9.7523e-01	-1.7035e+00	9.9716e-01	9.2223e-01	8.7666e-01
-2.2528e+00	4.9838e+00	2.6483e+00	2.7297e+00	8.6766e+00
0	1.5837e+00	6.2013e+00	1.4735e+00	1.0557e+01
0	-3.3157e+00	-2.4832e+00	1.2549e+00	-9.7736e+00
0	-1.1102e-16	-3.9413e-01	-2.2234e-01	1.5848e+00

G*H_4

9.7523e-01	-1.7035e+00	9.9716e-01	9.2223e-01	8.7666e-01
-2.2528e+00	4.9838e+00	2.6483e+00	2.7297e+00	8.6766e+00
0	3.6745e+00	4.9135e+00	-4.9728e-01	1.3369e+01
0	-2.2204e-16	4.5255e+00	1.8705e+00	5.3140e+00
0	-1.1102e-16	-3.9413e-01	-2.2234e-01	1.5848e+00

H_5 = G*H_4*Gt

9.7523e-01	-1.7035e+00	-4.0240e-01	1.2973e+00	8.7666e-01
-2.2528e+00	4.9838e+00	-1.3217e+00	3.5662e+00	8.6766e+00
0	3.6745e+00	2.5665e+00	4.2194e+00	1.3369e+01
0	-2.2204e-16	2.6267e-01	4.8898e+00	5.3140e+00
0	-1.1102e-16	3.0760e-02	-4.5148e-01	1.5848e+00

G*H

9.7523e-01	-1.7035e+00	-4.0240e-01	1.2973e+00	8.7666e-01
-2.2528e+00	4.9838e+00	-1.3217e+00	3.5662e+00	8.6766e+00
0	3.6745e+00	2.5665e+00	4.2194e+00	1.3369e+01
0	-2.3345e-16	2.6446e-01	4.8041e+00	5.4622e+00
0	-8.4443e-17	-3.4694e-18	-1.0171e+00	9.5593e-01

H <- G*H*Gt

9.7523e-01	-1.7035e+00	-4.0240e-01	1.3904e+00	7.1983e-01
-2.2528e+00	4.9838e+00	-1.3217e+00	4.5512e+00	8.2029e+00
0	3.6745e+00	2.5665e+00	5.7458e+00	1.2788e+01
0	-2.3345e-16	2.6446e-01	5.4068e+00	4.8664e+00

```

      0 -8.4443e-17 -3.4694e-18 -8.9905e-01 1.0678e+00
H =
  9.7523e-01 -1.7035e+00 -4.0240e-01 1.3904e+00 7.1983e-01
 -2.2528e+00 4.9838e+00 -1.3217e+00 4.5512e+00 8.2029e+00
      0 3.6745e+00 2.5665e+00 5.7458e+00 1.2788e+01
      0 -2.3345e-16 2.6446e-01 5.4068e+00 4.8664e+00
      0 0 0 -8.9905e-01 1.0678e+00
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Iterazione QR di base

$T_0 = H$;

Per $k=0, 1, 2, \dots$

$T_k = Q R$; (decomp QR di T_k),

$T_{k+1} := R Q$

iterazione 1

```

  5.7935e+00 1.0652e+00 -8.4022e-01 -2.3759e+00 7.6962e+00
-3.3937e+00 2.5993e+00 1.7186e-01 4.0838e+00 -1.3937e+01
      0 1.1994e+00 -1.2448e-01 -9.5800e-01 1.4921e+00
      0 0 1.2870e+00 4.8895e+00 -5.8777e+00
      0 0 0 2.8531e-01 1.8422e+00

```

iterazione 2

```

  5.9930e+00 2.4821e+00 4.1068e+00 -4.1099e+00 -1.3201e+01
-1.5309e+00 2.2797e+00 -1.7585e+00 -2.0198e-01 6.9999e+00
      0 -5.0964e-01 4.8917e+00 -2.1175e+00 -5.6309e+00
      0 0 1.8038e+00 -6.7434e-01 -4.1667e+00
      0 0 0 4.0205e-01 2.5098e+00

```

iterazione 3

```

  5.5375e+00 2.4773e+00 3.1933e+00 -1.5439e+01 1.4639e+00
-7.1002e-01 3.0099e+00 -1.2520e+00 3.8370e+00 -2.3061e+00
      0 -8.9299e-01 3.7602e+00 -7.2234e+00 -9.3767e-01
      0 0 1.6046e-01 1.3758e+00 -2.0541e-01
      0 0 0 -2.7054e+00 1.3167e+00

```

iterazione 4

```

  5.2737e+00 1.8027e+00 3.1872e+00 -9.9045e+00 1.2648e+01
-4.3484e-01 3.7409e+00 -6.6786e-01 3.4666e+00 -2.2035e+00
      0 -8.9195e-01 2.9914e+00 -2.2213e+00 6.3510e+00
      0 0 1.4960e-01 2.6892e+00 -2.0744e+00
      0 0 0 4.9117e-01 3.0486e-01

```

iterazione 5

```

  5.1513e+00 1.1456e+00 3.0372e+00 -7.9387e+00 -1.4394e+01
-3.2687e-01 4.1019e+00 1.4514e-02 2.5824e+00 3.0493e+00
      0 -6.3430e-01 2.6772e+00 -5.3254e-01 -5.9971e+00
      0 0 1.4872e-01 2.3638e+00 2.7504e+00
      0 0 0 -1.2521e-01 7.0578e-01

```

iterazione 6

```

  5.0953e+00 7.3874e-01 2.7243e+00 -7.4712e+00 1.4973e+01

```

-2.6687e-01	4.1877e+00	5.5428e-01	1.9419e+00	-3.1167e+00
0	-4.0368e-01	2.6427e+00	5.7706e-02	5.4513e+00
0	0	1.3172e-01	2.2095e+00	-3.1365e+00
0	0	0	4.5645e-02	8.6474e-01

iterazione 7

5.0682e+00	5.2503e-01	2.3819e+00	-7.3723e+00	-1.5272e+01
-2.2176e-01	4.1728e+00	9.1628e-01	1.4338e+00	2.8682e+00
0	-2.5709e-01	2.7000e+00	2.8569e-01	-5.0407e+00
0	0	1.0719e-01	2.1243e+00	3.4128e+00
0	0	0	-1.9420e-02	9.3470e-01

iterazione 8

5.0532e+00	4.1928e-01	2.0793e+00	-7.3724e+00	1.5451e+01
-1.8358e-01	4.1356e+00	1.1491e+00	1.0236e+00	-2.5118e+00
0	-1.6892e-01	2.7691e+00	3.7187e-01	4.7573e+00
0	0	8.1922e-02	2.0743e+00	-3.6109e+00
0	0	0	8.9118e-03	9.6777e-01

iterazione 9

5.0435e+00	3.6904e-01	1.8368e+00	-7.3940e+00	-1.5564e+01
-1.5073e-01	4.1002e+00	1.2990e+00	6.9281e-01	2.1441e+00
0	-1.1465e-01	2.8277e+00	4.0012e-01	-4.5654e+00
0	0	5.9942e-02	2.0447e+00	3.7500e+00
0	0	0	-4.2531e-03	9.8394e-01

iterazione 10

5.0361e+00	3.4673e-01	1.6521e+00	-7.4149e+00	1.5637e+01
-1.2280e-01	4.0720e+00	1.3973e+00	4.2737e-01	-1.8058e+00
0	-7.9902e-02	2.8728e+00	4.0506e-01	4.4365e+00
0	0	4.2589e-02	2.0271e+00	-3.8458e+00
0	0	0	2.0726e-03	9.9197e-01

iterazione 11

5.0301e+00	3.3834e-01	1.5153e+00	-7.4301e+00	-1.5684e+01
-9.9460e-02	4.0510e+00	1.4636e+00	2.1550e-01	1.5109e+00
0	-5.6806e-02	2.9063e+00	4.0136e-01	-4.3504e+00
0	0	2.9672e-02	2.0167e+00	3.9112e+00
0	0	0	-1.0215e-03	9.9598e-01

iterazione 12

5.0250e+00	3.3676e-01	1.4155e+00	-7.4397e+00	1.5715e+01
-8.0210e-02	4.0358e+00	1.5097e+00	4.6998e-02	-1.2614e+00
0	-4.0981e-02	2.9309e+00	3.9519e-01	4.2931e+00
0	0	2.0401e-02	2.0104e+00	-3.9554e+00
0	0	0	5.0654e-04	9.9799e-01

iterazione 13

5.0206e+00	3.3835e-01	1.3432e+00	-7.4450e+00	-1.5735e+01
-6.4493e-02	4.0249e+00	1.5426e+00	-8.6700e-02	1.0539e+00
0	-2.9881e-02	2.9489e+00	3.8902e-01	-4.2550e+00
0	0	1.3901e-02	2.0065e+00	3.9852e+00

0	0	0	-2.5206e-04	9.9899e-01
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iterazione 14

5.0170e+00	3.4127e-01	1.2909e+00	-7.4474e+00	1.5748e+01
-5.1751e-02	4.0172e+00	1.5668e+00	-1.9267e-01	-8.8318e-01
0	-2.1956e-02	2.9622e+00	3.8370e-01	4.2298e+00
0	0	9.4130e-03	2.0042e+00	-4.0053e+00
0	0	0	1.2567e-04	9.9950e-01

iterazione 15

5.0139e+00	3.4459e-01	1.2529e+00	-7.4481e+00	-1.5757e+01
-4.1470e-02	4.0117e+00	1.5848e+00	-2.7664e-01	7.4377e-01
0	-1.6223e-02	2.9720e+00	3.7942e-01	-4.2131e+00
0	0	6.3463e-03	2.0027e+00	4.0187e+00
0	0	0	-6.2728e-05	9.9975e-01

iterazione 16

5.0113e+00	3.4784e-01	1.2253e+00	-7.4477e+00	1.5762e+01
-3.3203e-02	4.0079e+00	1.5986e+00	-3.4319e-01	-6.3044e-01
0	-1.2036e-02	2.9792e+00	3.7610e-01	4.2020e+00
0	0	4.2655e-03	2.0017e+00	-4.0277e+00
0	0	0	3.1331e-05	9.9987e-01

iterazione 17

5.0092e+00	3.5083e-01	1.2051e+00	-7.4467e+00	-1.5766e+01
-2.6569e-02	4.0052e+00	1.6092e+00	-3.9596e-01	5.3859e-01
0	-8.9565e-03	2.9845e+00	3.7358e-01	-4.1946e+00
0	0	2.8606e-03	2.0011e+00	4.0337e+00
0	0	0	-1.5655e-05	9.9994e-01

iterazione 18

5.0074e+00	3.5347e-01	1.1903e+00	-7.4455e+00	1.5769e+01
-2.1254e-02	4.0034e+00	1.6174e+00	-4.3784e-01	-4.6433e-01
0	-6.6790e-03	2.9885e+00	3.7169e-01	4.1897e+00
0	0	1.9154e-03	2.0007e+00	-4.0377e+00
0	0	0	7.8242e-06	9.9997e-01

iterazione 19

5.0060e+00	3.5575e-01	1.1792e+00	-7.4443e+00	-1.5771e+01
-1.6998e-02	4.0021e+00	1.6239e+00	-4.7110e-01	4.0438e-01
0	-4.9885e-03	2.9914e+00	3.7029e-01	-4.1865e+00
0	0	1.2810e-03	2.0005e+00	4.0404e+00
0	0	0	-3.9110e-06	9.9998e-01

iterazione 20

5.0048e+00	3.5769e-01	1.1709e+00	-7.4431e+00	1.5772e+01
-1.3593e-02	4.0013e+00	1.6289e+00	-4.9753e-01	-3.5605e-01
0	-3.7301e-03	2.9936e+00	3.6926e-01	4.1843e+00
0	0	8.5603e-04	2.0003e+00	-4.0422e+00
0	0	0	1.9552e-06	9.9999e-01

iterazione 21

5.0039e+00	3.5933e-01	1.1647e+00	-7.4421e+00	-1.5773e+01
-1.0870e-02	4.0007e+00	1.6329e+00	-5.1856e-01	3.1711e-01
0	-2.7915e-03	2.9952e+00	3.6849e-01	-4.1828e+00
0	0	5.7168e-04	2.0002e+00	4.0434e+00
0	0	0	-9.7748e-07	1.0000e+00

iterazione 22

5.0031e+00	3.6070e-01	1.1600e+00	-7.4411e+00	1.5774e+01
-8.6926e-03	4.0003e+00	1.6360e+00	-5.3529e-01	-2.8576e-01
0	-2.0903e-03	2.9964e+00	3.6793e-01	4.1819e+00
0	0	3.8161e-04	2.0001e+00	-4.0442e+00
0	0	0	4.8870e-07	1.0000e+00

iterazione 23

5.0025e+00	3.6183e-01	1.1564e+00	-7.4403e+00	-1.5774e+01
-6.9513e-03	4.0001e+00	1.6385e+00	-5.4862e-01	2.6054e-01
0	-1.5660e-03	2.9973e+00	3.6752e-01	-4.1812e+00
0	0	2.5465e-04	2.0001e+00	4.0447e+00
0	0	0	-2.4434e-07	1.0000e+00

iterazione 24

5.0020e+00	3.6277e-01	1.1536e+00	-7.4397e+00	1.5775e+01
-5.5590e-03	3.9999e+00	1.6404e+00	-5.5924e-01	-2.4025e-01
0	-1.1735e-03	2.9980e+00	3.6722e-01	4.1808e+00
0	0	1.6988e-04	2.0001e+00	-4.0451e+00
0	0	0	1.2217e-07	1.0000e+00

iterazione 25

5.0016e+00	3.6355e-01	1.1515e+00	-7.4391e+00	-1.5775e+01
-4.4458e-03	3.9998e+00	1.6420e+00	-5.6771e-01	2.2395e-01
0	-8.7962e-04	2.9985e+00	3.6700e-01	-4.1805e+00
0	0	1.1332e-04	2.0000e+00	4.0453e+00
0	0	0	-6.1082e-08	1.0000e+00

iterazione 26

5.0013e+00	3.6419e-01	1.1498e+00	-7.4386e+00	1.5775e+01
-3.5556e-03	3.9998e+00	1.6432e+00	-5.7446e-01	-2.1085e-01
0	-6.5944e-04	2.9989e+00	3.6683e-01	4.1803e+00
0	0	7.5573e-05	2.0000e+00	-4.0455e+00
0	0	0	3.0540e-08	1.0000e+00

iterazione 27

5.0010e+00	3.6471e-01	1.1485e+00	-7.4383e+00	-1.5775e+01
-2.8438e-03	3.9998e+00	1.6442e+00	-5.7985e-01	2.0032e-01
0	-4.9444e-04	2.9992e+00	3.6671e-01	-4.1801e+00
0	0	5.0397e-05	2.0000e+00	4.0456e+00
0	0	0	-1.5270e-08	1.0000e+00

iterazione 28

5.0008e+00	3.6514e-01	1.1475e+00	-7.4379e+00	1.5775e+01
-2.2746e-03	3.9998e+00	1.6449e+00	-5.8416e-01	-1.9187e-01

0	-3.7075e-04	2.9994e+00	3.6662e-01	4.1801e+00
0	0	3.3605e-05	2.0000e+00	-4.0456e+00
0	0	0	7.6350e-09	1.0000e+00

iterazione 29

5.0007e+00	3.6549e-01	1.1467e+00	-7.4377e+00	-1.5775e+01
-1.8193e-03	3.9998e+00	1.6455e+00	-5.8759e-01	1.8508e-01
0	-2.7802e-04	2.9995e+00	3.6656e-01	-4.1800e+00
0	0	2.2407e-05	2.0000e+00	4.0457e+00
0	0	0	-3.8175e-09	1.0000e+00

iterazione 30

5.0005e+00	3.6577e-01	1.1461e+00	-7.4375e+00	1.5775e+01
-1.4552e-03	3.9998e+00	1.6460e+00	-5.9034e-01	-1.7963e-01
0	-2.0850e-04	2.9997e+00	3.6651e-01	4.1800e+00
0	0	1.4940e-05	2.0000e+00	-4.0457e+00
0	0	0	1.9087e-09	1.0000e+00

iterazione 31

5.0004e+00	3.6600e-01	1.1456e+00	-7.4373e+00	-1.5776e+01
-1.1640e-03	3.9998e+00	1.6464e+00	-5.9253e-01	1.7526e-01
0	-1.5636e-04	2.9997e+00	3.6647e-01	-4.1799e+00
0	0	9.9607e-06	2.0000e+00	4.0457e+00
0	0	0	-9.5437e-10	1.0000e+00

iterazione 32

5.0003e+00	3.6619e-01	1.1452e+00	-7.4372e+00	1.5776e+01
-9.3113e-04	3.9999e+00	1.6467e+00	-5.9428e-01	-1.7175e-01
0	-1.1727e-04	2.9998e+00	3.6644e-01	4.1799e+00
0	0	6.6409e-06	2.0000e+00	-4.0458e+00
0	0	0	4.7718e-10	1.0000e+00

iterazione 33

5.0003e+00	3.6634e-01	1.1449e+00	-7.4371e+00	-1.5776e+01
-7.4484e-04	3.9999e+00	1.6469e+00	-5.9568e-01	1.6893e-01
0	-8.7948e-05	2.9999e+00	3.6643e-01	-4.1799e+00
0	0	4.4275e-06	2.0000e+00	4.0458e+00
0	0	0	-2.3859e-10	1.0000e+00

iterazione 34

5.0002e+00	3.6647e-01	1.1447e+00	-7.4370e+00	1.5776e+01
-5.9583e-04	3.9999e+00	1.6471e+00	-5.9680e-01	-1.6667e-01
0	-6.5960e-05	2.9999e+00	3.6641e-01	4.1799e+00
0	0	2.9518e-06	2.0000e+00	-4.0458e+00
0	0	0	1.1930e-10	1.0000e+00

iterazione 35

5.0002e+00	3.6657e-01	1.1445e+00	-7.4369e+00	-1.5776e+01
-4.7663e-04	3.9999e+00	1.6473e+00	-5.9769e-01	1.6486e-01
0	-4.9469e-05	2.9999e+00	3.6640e-01	-4.1799e+00
0	0	1.9679e-06	2.0000e+00	4.0458e+00
0	0	0	-5.9648e-11	1.0000e+00

iterazione 36

5.0001e+00	3.6665e-01	1.1443e+00	-7.4369e+00	1.5776e+01
-3.8129e-04	3.9999e+00	1.6474e+00	-5.9840e-01	-1.6341e-01
0	-3.7102e-05	2.9999e+00	3.6639e-01	4.1799e+00
0	0	1.3120e-06	2.0000e+00	-4.0458e+00
0	0	0	2.9824e-11	1.0000e+00

iterazione 37

5.0001e+00	3.6671e-01	1.1442e+00	-7.4368e+00	-1.5776e+01
-3.0502e-04	3.9999e+00	1.6475e+00	-5.9898e-01	1.6225e-01
0	-2.7826e-05	3.0000e+00	3.6639e-01	-4.1799e+00
0	0	8.7466e-07	2.0000e+00	4.0458e+00
0	0	0	-1.4912e-11	1.0000e+00

iterazione 38

5.0001e+00	3.6677e-01	1.1441e+00	-7.4368e+00	1.5776e+01
-2.4401e-04	3.9999e+00	1.6476e+00	-5.9943e-01	-1.6131e-01
0	-2.0870e-05	3.0000e+00	3.6638e-01	4.1799e+00
0	0	5.8311e-07	2.0000e+00	-4.0458e+00
0	0	0	7.4560e-12	1.0000e+00

iterazione 39

5.0001e+00	3.6681e-01	1.1440e+00	-7.4367e+00	-1.5776e+01
-1.9520e-04	4.0000e+00	1.6476e+00	-5.9980e-01	1.6057e-01
0	-1.5652e-05	3.0000e+00	3.6638e-01	-4.1799e+00
0	0	3.8875e-07	2.0000e+00	4.0458e+00
0	0	0	-3.7280e-12	1.0000e+00

iterazione 40

5.0001e+00	3.6684e-01	1.1439e+00	-7.4367e+00	1.5776e+01
-1.5616e-04	4.0000e+00	1.6477e+00	-6.0009e-01	-1.5997e-01
0	-1.1739e-05	3.0000e+00	3.6638e-01	4.1799e+00
0	0	2.5917e-07	2.0000e+00	-4.0458e+00
0	0	0	1.8640e-12	1.0000e+00

iterazione 41

5.0000e+00	3.6687e-01	1.1439e+00	-7.4367e+00	-1.5776e+01
-1.2492e-04	4.0000e+00	1.6477e+00	-6.0032e-01	1.5949e-01
0	-8.8044e-06	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	1.7278e-07	2.0000e+00	4.0458e+00
0	0	0	-9.3199e-13	1.0000e+00

iterazione 42

5.0000e+00	3.6689e-01	1.1438e+00	-7.4367e+00	1.5776e+01
-9.9937e-05	4.0000e+00	1.6478e+00	-6.0051e-01	-1.5910e-01
0	-6.6033e-06	3.0000e+00	3.6637e-01	4.1799e+00
0	0	1.1519e-07	2.0000e+00	-4.0458e+00
0	0	0	4.6600e-13	1.0000e+00

iterazione 43

5.0000e+00	3.6691e-01	1.1438e+00	-7.4367e+00	-1.5776e+01
-7.9949e-05	4.0000e+00	1.6478e+00	-6.0066e-01	1.5879e-01
0	-4.9525e-06	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	7.6791e-08	2.0000e+00	4.0458e+00
0	0	0	-2.3300e-13	1.0000e+00

iterazione 44

5.0000e+00	3.6693e-01	1.1438e+00	-7.4367e+00	1.5776e+01
-6.3958e-05	4.0000e+00	1.6478e+00	-6.0078e-01	-1.5855e-01
0	-3.7144e-06	3.0000e+00	3.6637e-01	4.1799e+00
0	0	5.1194e-08	2.0000e+00	-4.0458e+00
0	0	0	1.1650e-13	1.0000e+00

iterazione 45

5.0000e+00	3.6694e-01	1.1438e+00	-7.4367e+00	-1.5776e+01
-5.1166e-05	4.0000e+00	1.6478e+00	-6.0087e-01	1.5835e-01
0	-2.7858e-06	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	3.4129e-08	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 46

5.0000e+00	3.6695e-01	1.1437e+00	-7.4367e+00	1.5776e+01
-4.0933e-05	4.0000e+00	1.6478e+00	-6.0095e-01	-1.5819e-01
0	-2.0893e-06	3.0000e+00	3.6637e-01	4.1799e+00
0	0	2.2753e-08	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 47

5.0000e+00	3.6696e-01	1.1437e+00	-7.4367e+00	-1.5776e+01
-3.2746e-05	4.0000e+00	1.6478e+00	-6.0101e-01	1.5806e-01
0	-1.5670e-06	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	1.5169e-08	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 48

5.0000e+00	3.6696e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-2.6197e-05	4.0000e+00	1.6478e+00	-6.0106e-01	-1.5796e-01
0	-1.1753e-06	3.0000e+00	3.6637e-01	4.1799e+00
0	0	1.0112e-08	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 49

5.0000e+00	3.6697e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-2.0957e-05	4.0000e+00	1.6478e+00	-6.0110e-01	1.5788e-01
0	-8.8144e-07	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	6.7416e-09	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 50

5.0000e+00	3.6697e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-1.6766e-05	4.0000e+00	1.6479e+00	-6.0113e-01	-1.5781e-01
0	-6.6108e-07	3.0000e+00	3.6637e-01	4.1799e+00

0	0	4.4944e-09	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 51

5.0000e+00	3.6697e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-1.3413e-05	4.0000e+00	1.6479e+00	-6.0116e-01	1.5776e-01
0	-4.9581e-07	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	2.9963e-09	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 52

5.0000e+00	3.6698e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-1.0730e-05	4.0000e+00	1.6479e+00	-6.0118e-01	-1.5772e-01
0	-3.7186e-07	3.0000e+00	3.6637e-01	4.1799e+00
0	0	1.9975e-09	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 53

5.0000e+00	3.6698e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-8.5840e-06	4.0000e+00	1.6479e+00	-6.0119e-01	1.5769e-01
0	-2.7890e-07	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	1.3317e-09	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 54

5.0000e+00	3.6698e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-6.8672e-06	4.0000e+00	1.6479e+00	-6.0120e-01	-1.5766e-01
0	-2.0917e-07	3.0000e+00	3.6637e-01	4.1799e+00
0	0	8.8778e-10	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 55

5.0000e+00	3.6698e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-5.4938e-06	4.0000e+00	1.6479e+00	-6.0121e-01	1.5764e-01
0	-1.5688e-07	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	5.9186e-10	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 56

5.0000e+00	3.6698e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-4.3950e-06	4.0000e+00	1.6479e+00	-6.0122e-01	-1.5762e-01
0	-1.1766e-07	3.0000e+00	3.6637e-01	4.1799e+00
0	0	3.9457e-10	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 57

5.0000e+00	3.6698e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-3.5160e-06	4.0000e+00	1.6479e+00	-6.0123e-01	1.5761e-01
0	-8.8244e-08	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	2.6305e-10	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 58

5.0000e+00	3.6698e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-2.8128e-06	4.0000e+00	1.6479e+00	-6.0123e-01	-1.5760e-01
0	-6.6183e-08	3.0000e+00	3.6637e-01	4.1799e+00
0	0	1.7536e-10	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 59

5.0000e+00	3.6698e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-2.2502e-06	4.0000e+00	1.6479e+00	-6.0124e-01	1.5759e-01
0	-4.9637e-08	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	1.1691e-10	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 60

5.0000e+00	3.6698e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-1.8002e-06	4.0000e+00	1.6479e+00	-6.0124e-01	-1.5758e-01
0	-3.7228e-08	3.0000e+00	3.6637e-01	4.1799e+00
0	0	7.7940e-11	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 61

5.0000e+00	3.6698e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-1.4402e-06	4.0000e+00	1.6479e+00	-6.0124e-01	1.5757e-01
0	-2.7921e-08	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	5.1960e-11	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 62

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-1.1521e-06	4.0000e+00	1.6479e+00	-6.0125e-01	-1.5757e-01
0	-2.0941e-08	3.0000e+00	3.6637e-01	4.1799e+00
0	0	3.4640e-11	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 63

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-9.2170e-07	4.0000e+00	1.6479e+00	-6.0125e-01	1.5757e-01
0	-1.5706e-08	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	2.3093e-11	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 64

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-7.3736e-07	4.0000e+00	1.6479e+00	-6.0125e-01	-1.5756e-01
0	-1.1779e-08	3.0000e+00	3.6637e-01	4.1799e+00
0	0	1.5396e-11	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 65

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
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-5.8989e-07	4.0000e+00	1.6479e+00	-6.0125e-01	1.5756e-01
0	-8.8344e-09	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	1.0264e-11	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 66

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-4.7191e-07	4.0000e+00	1.6479e+00	-6.0125e-01	-1.5756e-01
0	-6.6258e-09	3.0000e+00	3.6637e-01	4.1799e+00
0	0	6.8425e-12	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 67

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-3.7753e-07	4.0000e+00	1.6479e+00	-6.0125e-01	1.5756e-01
0	-4.9693e-09	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	4.5616e-12	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 68

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-3.0202e-07	4.0000e+00	1.6479e+00	-6.0125e-01	-1.5756e-01
0	-3.7270e-09	3.0000e+00	3.6637e-01	4.1799e+00
0	0	3.0411e-12	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 69

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-2.4162e-07	4.0000e+00	1.6479e+00	-6.0125e-01	1.5756e-01
0	-2.7953e-09	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	2.0274e-12	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 70

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-1.9329e-07	4.0000e+00	1.6479e+00	-6.0125e-01	-1.5755e-01
0	-2.0964e-09	3.0000e+00	3.6637e-01	4.1799e+00
0	0	1.3516e-12	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 71

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-1.5464e-07	4.0000e+00	1.6479e+00	-6.0125e-01	1.5755e-01
0	-1.5723e-09	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	9.0106e-13	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 72

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-1.2371e-07	4.0000e+00	1.6479e+00	-6.0125e-01	-1.5755e-01
0	-1.1792e-09	3.0000e+00	3.6637e-01	4.1799e+00
0	0	6.0071e-13	2.0000e+00	-4.0458e+00

0	0	0	0	1.0000e+00
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iterazione 73

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-9.8967e-08	4.0000e+00	1.6479e+00	-6.0125e-01	1.5755e-01
0	-8.8444e-10	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	4.0047e-13	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 74

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-7.9173e-08	4.0000e+00	1.6479e+00	-6.0125e-01	-1.5755e-01
0	-6.6333e-10	3.0000e+00	3.6637e-01	4.1799e+00
0	0	2.6698e-13	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 75

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-6.3339e-08	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01
0	-4.9750e-10	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	1.7799e-13	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 76

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-5.0671e-08	4.0000e+00	1.6479e+00	-6.0126e-01	-1.5755e-01
0	-3.7312e-10	3.0000e+00	3.6637e-01	4.1799e+00
0	0	1.1866e-13	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 77

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-4.0537e-08	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01
0	-2.7984e-10	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	0	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 78

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-3.2429e-08	4.0000e+00	1.6479e+00	-6.0126e-01	-1.5755e-01
0	-2.0988e-10	3.0000e+00	3.6637e-01	4.1799e+00
0	0	0	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 79

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-2.5943e-08	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01
0	-1.5741e-10	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	0	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 80

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-2.0755e-08	4.0000e+00	1.6479e+00	-6.0126e-01	-1.5755e-01
0	-1.1806e-10	3.0000e+00	3.6637e-01	4.1799e+00
0	0	0	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 81

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-1.6604e-08	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01
0	-8.8544e-11	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	0	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 82

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-1.3283e-08	4.0000e+00	1.6479e+00	-6.0126e-01	-1.5755e-01
0	-6.6408e-11	3.0000e+00	3.6637e-01	4.1799e+00
0	0	0	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 83

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-1.0626e-08	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01
0	-4.9806e-11	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	0	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 84

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-8.5012e-09	4.0000e+00	1.6479e+00	-6.0126e-01	-1.5755e-01
0	-3.7354e-11	3.0000e+00	3.6637e-01	4.1799e+00
0	0	0	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 85

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-6.8009e-09	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01
0	-2.8016e-11	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	0	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 86

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-5.4407e-09	4.0000e+00	1.6479e+00	-6.0126e-01	-1.5755e-01
0	-2.1012e-11	3.0000e+00	3.6637e-01	4.1799e+00
0	0	0	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 87

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-4.3526e-09	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01

0	-1.5759e-11	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	0	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 88

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-3.4821e-09	4.0000e+00	1.6479e+00	-6.0126e-01	-1.5755e-01
0	-1.1819e-11	3.0000e+00	3.6637e-01	4.1799e+00
0	0	0	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 89

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-2.7857e-09	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01
0	-8.8644e-12	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	0	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 90

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-2.2285e-09	4.0000e+00	1.6479e+00	-6.0126e-01	-1.5755e-01
0	-6.6483e-12	3.0000e+00	3.6637e-01	4.1799e+00
0	0	0	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 91

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-1.7828e-09	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01
0	-4.9862e-12	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	0	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 92

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-1.4263e-09	4.0000e+00	1.6479e+00	-6.0126e-01	-1.5755e-01
0	-3.7397e-12	3.0000e+00	3.6637e-01	4.1799e+00
0	0	0	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 93

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-1.1410e-09	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01
0	-2.8047e-12	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	0	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 94

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-9.1281e-10	4.0000e+00	1.6479e+00	-6.0126e-01	-1.5755e-01
0	-2.1036e-12	3.0000e+00	3.6637e-01	4.1799e+00
0	0	0	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 95

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-7.3024e-10	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01
0	-1.5777e-12	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	0	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 96

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-5.8420e-10	4.0000e+00	1.6479e+00	-6.0126e-01	-1.5755e-01
0	-1.1832e-12	3.0000e+00	3.6637e-01	4.1799e+00
0	0	0	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 97

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-4.6736e-10	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01
0	-8.8744e-13	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	0	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 98

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-3.7389e-10	4.0000e+00	1.6479e+00	-6.0126e-01	-1.5755e-01
0	-6.6558e-13	3.0000e+00	3.6637e-01	4.1799e+00
0	0	0	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 99

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-2.9911e-10	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01
0	-4.9918e-13	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	0	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 100

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-2.3929e-10	4.0000e+00	1.6479e+00	-6.0126e-01	-1.5755e-01
0	-3.7439e-13	3.0000e+00	3.6637e-01	4.1799e+00
0	0	0	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 101

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-1.9143e-10	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01
0	-2.8079e-13	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	0	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 102

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-1.5314e-10	4.0000e+00	1.6479e+00	-6.0126e-01	-1.5755e-01
0	-2.1059e-13	3.0000e+00	3.6637e-01	4.1799e+00
0	0	0	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 103

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-1.2251e-10	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01
0	-1.5794e-13	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	0	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 104

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-9.8012e-11	4.0000e+00	1.6479e+00	-6.0126e-01	-1.5755e-01
0	-1.1846e-13	3.0000e+00	3.6637e-01	4.1799e+00
0	0	0	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 105

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-7.8409e-11	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01
0	0	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	0	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 106

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-6.2727e-11	4.0000e+00	1.6479e+00	-6.0126e-01	-1.5755e-01
0	0	3.0000e+00	3.6637e-01	4.1799e+00
0	0	0	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 107

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-5.0182e-11	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01
0	0	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	0	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 108

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-4.0146e-11	4.0000e+00	1.6479e+00	-6.0126e-01	-1.5755e-01
0	0	3.0000e+00	3.6637e-01	4.1799e+00
0	0	0	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 109

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-3.2116e-11	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01
0	0	3.0000e+00	3.6637e-01	-4.1799e+00

0	0	0	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 110

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-2.5693e-11	4.0000e+00	1.6479e+00	-6.0126e-01	-1.5755e-01
0	0	3.0000e+00	3.6637e-01	4.1799e+00
0	0	0	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 111

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-2.0555e-11	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01
0	0	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	0	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 112

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-1.6444e-11	4.0000e+00	1.6479e+00	-6.0126e-01	-1.5755e-01
0	0	3.0000e+00	3.6637e-01	4.1799e+00
0	0	0	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 113

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-1.3155e-11	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01
0	0	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	0	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 114

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-1.0524e-11	4.0000e+00	1.6479e+00	-6.0126e-01	-1.5755e-01
0	0	3.0000e+00	3.6637e-01	4.1799e+00
0	0	0	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 115

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-8.4191e-12	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01
0	0	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	0	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 116

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-6.7353e-12	4.0000e+00	1.6479e+00	-6.0126e-01	-1.5755e-01
0	0	3.0000e+00	3.6637e-01	4.1799e+00
0	0	0	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 117

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-5.3883e-12	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01
0	0	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	0	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 118

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-4.3106e-12	4.0000e+00	1.6479e+00	-6.0126e-01	-1.5755e-01
0	0	3.0000e+00	3.6637e-01	4.1799e+00
0	0	0	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 119

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-3.4485e-12	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01
0	0	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	0	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 120

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-2.7588e-12	4.0000e+00	1.6479e+00	-6.0126e-01	-1.5755e-01
0	0	3.0000e+00	3.6637e-01	4.1799e+00
0	0	0	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 121

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-2.2070e-12	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01
0	0	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	0	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 122

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-1.7656e-12	4.0000e+00	1.6479e+00	-6.0126e-01	-1.5755e-01
0	0	3.0000e+00	3.6637e-01	4.1799e+00
0	0	0	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 123

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-1.4125e-12	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01
0	0	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	0	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 124

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
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-1.1300e-12	4.0000e+00	1.6479e+00	-6.0126e-01	-1.5755e-01
0	0	3.0000e+00	3.6637e-01	4.1799e+00
0	0	0	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 125

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-9.0400e-13	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01
0	0	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	0	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 126

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-7.2320e-13	4.0000e+00	1.6479e+00	-6.0126e-01	-1.5755e-01
0	0	3.0000e+00	3.6637e-01	4.1799e+00
0	0	0	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 127

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-5.7856e-13	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01
0	0	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	0	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 128

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-4.6285e-13	4.0000e+00	1.6479e+00	-6.0126e-01	-1.5755e-01
0	0	3.0000e+00	3.6637e-01	4.1799e+00
0	0	0	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 129

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-3.7028e-13	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01
0	0	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	0	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 130

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-2.9622e-13	4.0000e+00	1.6479e+00	-6.0126e-01	-1.5755e-01
0	0	3.0000e+00	3.6637e-01	4.1799e+00
0	0	0	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 131

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-2.3698e-13	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01
0	0	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	0	2.0000e+00	4.0458e+00

0	0	0	0	1.0000e+00
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iterazione 132

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-1.8958e-13	4.0000e+00	1.6479e+00	-6.0126e-01	-1.5755e-01
0	0	3.0000e+00	3.6637e-01	4.1799e+00
0	0	0	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 133

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
-1.5167e-13	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01
0	0	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	0	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

iterazione 134

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	1.5776e+01
-1.2133e-13	4.0000e+00	1.6479e+00	-6.0126e-01	-1.5755e-01
0	0	3.0000e+00	3.6637e-01	4.1799e+00
0	0	0	2.0000e+00	-4.0458e+00
0	0	0	0	1.0000e+00

iterazione 135

5.0000e+00	3.6699e-01	1.1437e+00	-7.4366e+00	-1.5776e+01
0	4.0000e+00	1.6479e+00	-6.0126e-01	1.5755e-01
0	0	3.0000e+00	3.6637e-01	-4.1799e+00
0	0	0	2.0000e+00	4.0458e+00
0	0	0	0	1.0000e+00

numero di iterazioni QR: 135

Calcolo di un autovettore con una iterazione delle potenze inverse
 $x = (A - T(3,3) * \text{eye}(n)) \backslash x_0$; $x = x / \text{norm}(x)$
 $x =$
4.5950e-01
5.1219e-01
7.1344e-01
-5.4244e-02
-1.2073e-01

Iterazione QR con shift (implementazione semplice)
(cambio shift quando il corrispondente elemento $T(k+1,k)$ sotto la diagonale k e' sufficientemente piccolo)

# it QR	#riga k+1	$T(k+1,k)$
6.0000e+00	5.0000e+00	7.6528e-14
3.0000e+00	4.0000e+00	7.0442e-15
3.0000e+00	3.0000e+00	-1.5283e-14
3.0000e+00	2.0000e+00	-1.0407e-20

numero di iterazioni QR: 15
(da confrontare con le 135 its dell'algoritmo di base)
