Scientific Computing: Homework 2

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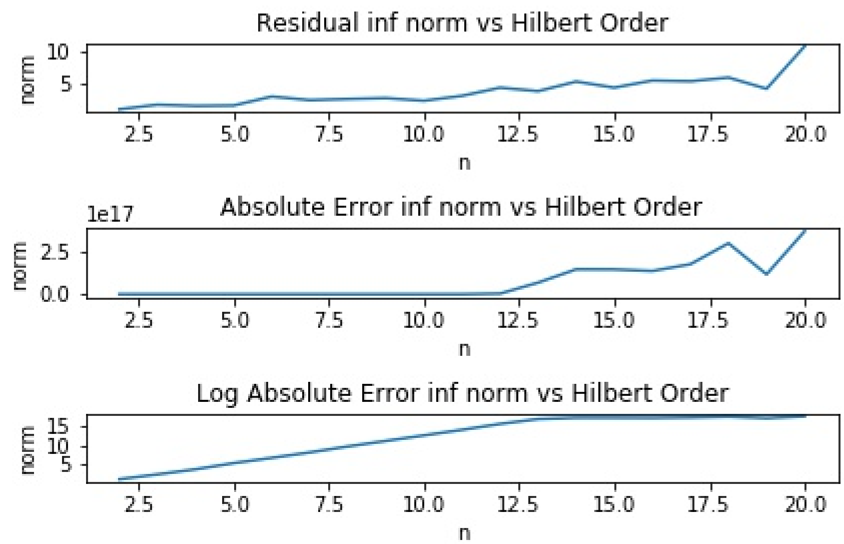
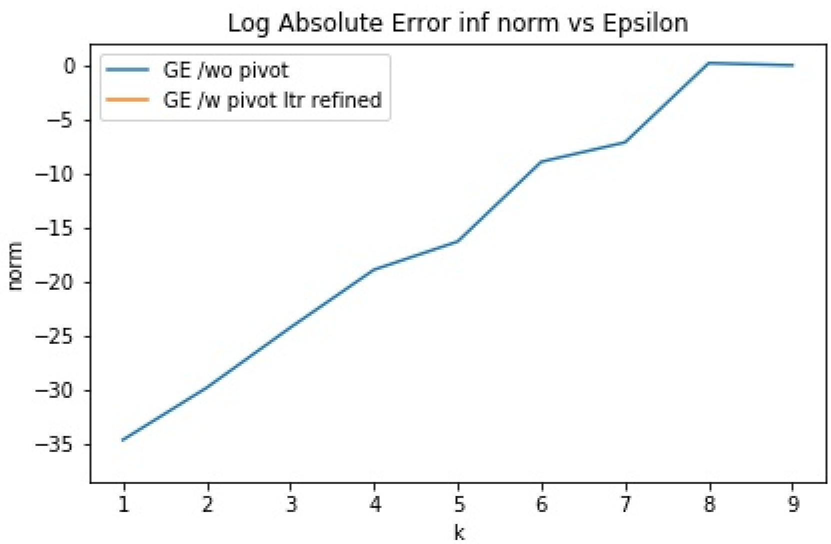
Problem 1: Hilbert matrix conditioning



As we can see from the graph the log of inf norm of the Absolute error, it remains constant after n=12, i.e. there is a huge change in error that remains constant, that is, there must be no significant digits in the solution after n=12.

Problem 2: Gaussian elimination and partial pivoting

(a)



Log Norm vs k in 10^{-2k}

As we can see in the graph, the log of Absolute Error Inf Norm increases as the epsilon value decreases (k in 10^{-2k} increases). I.e. the accuracy of the solution decreases.

(b)

In Gaussian Elimination without pivoting As we can see in the graph, the log of F Norm increases as the epsilon value decreases (k in 10^{-2k} increases). I.e. the accuracy of the solution decreases.
But Gaussian Elimination without pivoting and iterative refinement error is less than 10e-16 the resolution of np.float

For case A, absolute errors are [8.88178420e-16, 1.10134124e-13, 2.87556645e-11, 6.07747097e-09, 8.27403710e-08, 1.33144023e-04, 7.99277837e-04, 1.22044605e+00, 1.00000000e+00,1.00000000e+00]
For case B absolute errors are [0.00000000e+00, 0.00000000e+00, 0.00000000e+00, 0.00000000e+00, 0.00000000e+00, 0.00000000e+00, 0.00000000e+00, 0.00000000e+00, 0.00000000e+00, 0.00000000e+00]