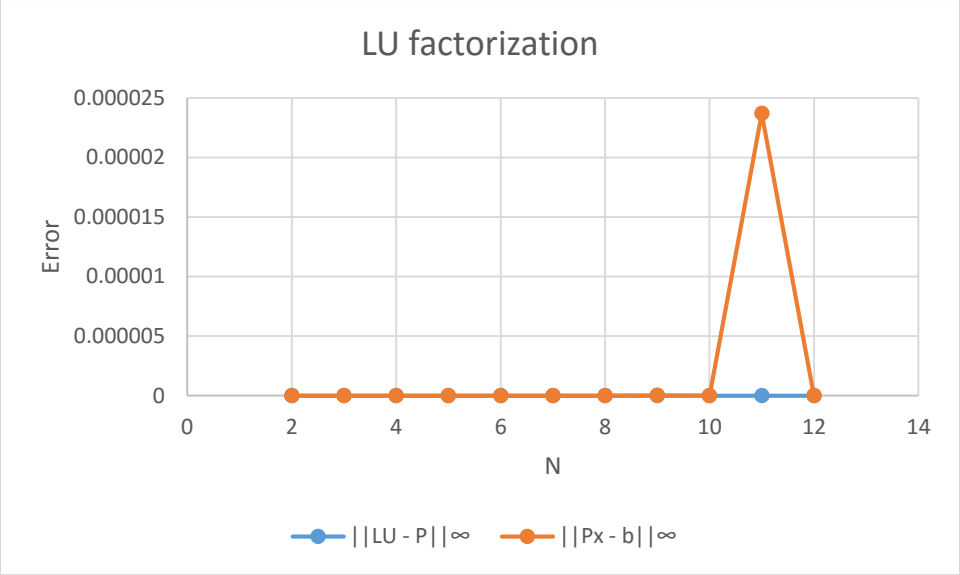
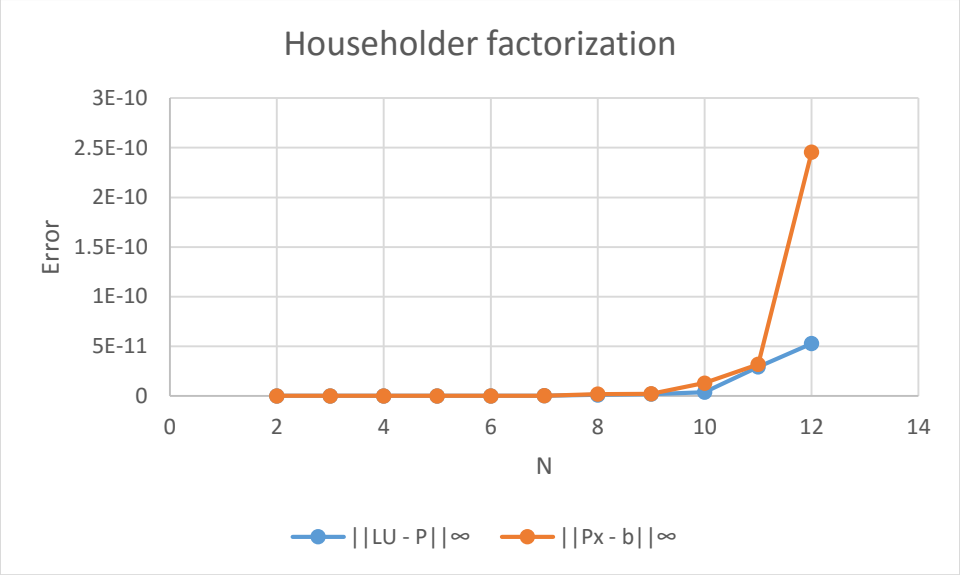
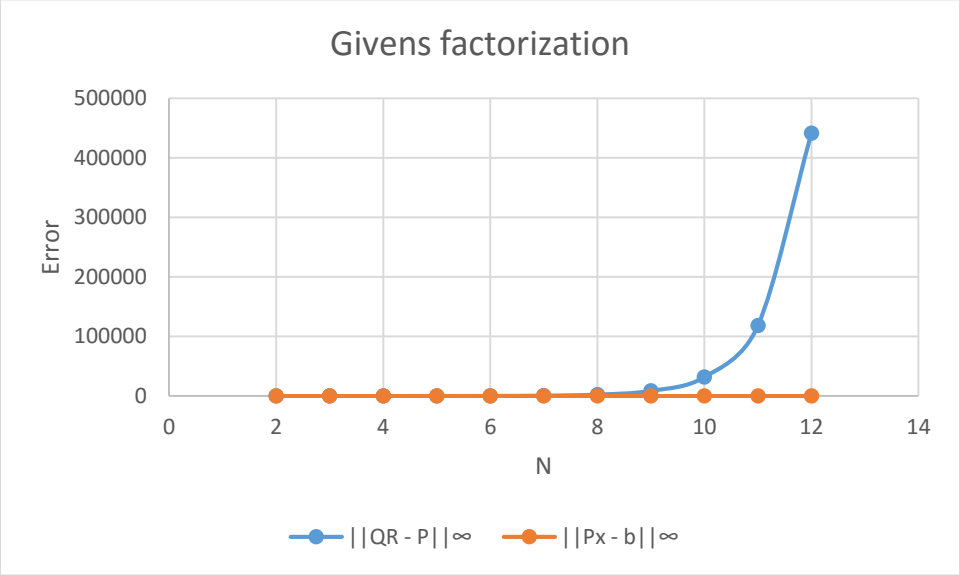
Problem 1 Written Component

It is justified to use LU or QR-factorizations instead of inverting the matrix A because calculating the inverse matrix is a time-expensive operation that can product a larger conditioning error in matrices with a large condition number. So the disadvantages are twofold: the operation takes longer to complete, and the calculation is susceptible to higher error.
Solving the system of equations using the inverse matrix involves multiplying both sides of the system by the inverse matrix A^{-1}, which would cancel out the matrix into the identity matrix and easily give the answer. However, the process of finding the identity matrix requires solving n systems of equations, or one for each column of the inverse to be found. These operations take time and introduce **numerical error** into the answer. Inverting a matrix requires more of these numerical error-introducing operations than the factorizations that break a matrix into triangle matrices and solve via substitution, such as LU and QR-factorization.

Plots


LU factorization
0.000025
0.00002
0.000015
0.00001
0.000005
0
Error
0
2
4
6
8
10
12
14
N
||LU - P||∞
||Px - b||∞


Householder factorization
3E-10
2.5E-10
2E-10
1.5E-10
1E-10
5E-11
0
Error
0
2
4
6
8
10
12
14
N
||LU - P||∞
||Px - b||∞


Givens factorization
500000
400000
300000
200000
100000
0
Error
0
2
4
6
8
10
12
14
N
||QR - P||∞
||Px - b||∞

Works Cited

http://www.mathworks.com/help/matlab/ref/inv.html#zmw57dd0e345166 | MATLAB Invert Matrix Reference

http://www.netlib.org/lapack/lawnspdf/lawn27.pdf | Stability of Methods for Matrix Inversion