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Part One Summary

(i) Why is it justified to use the LU or QR−factorizations as opposed of calculating an inverse matrix?

(ii) What is the benefit of using LU or QR−factorizations in this way? (Your answer should consider the benefit in terms of conditioning error.)

Response

*** Graphs and Table Below**

(i) Taking the inverse of a matrix requires setting up a series of n equations used to solve for a solution x, and additionally requires matrix multiplication. For instance, a 3x3 matrix requires 3 separate equations. As n increases, so too do the number of equations, resulting in tedious work that is also less accurate when compared to LU and QR factorizations. In order to solve for x using the equation $x = A^{-1} – b$, you must perform a multitude of row operations to create these equations. With LU and QR, you do not need to perform these operations.

(ii) The use of LU or QR factorization allows for a much less error prone process that is also more efficient for matrices of greater size. LU and QR decomposition also utilize substitution by creating either reflection matrices or lower and upper matrices that create the original matrix.

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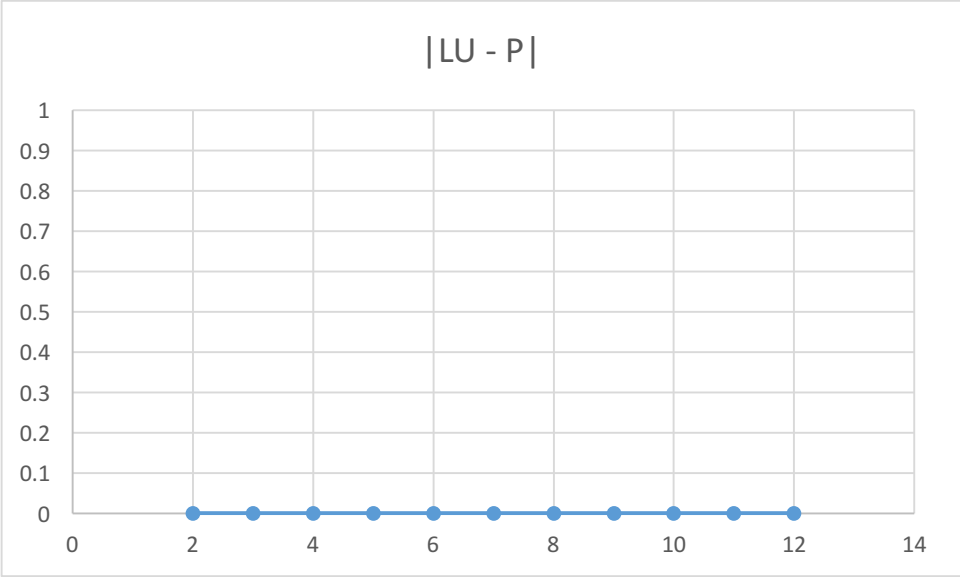

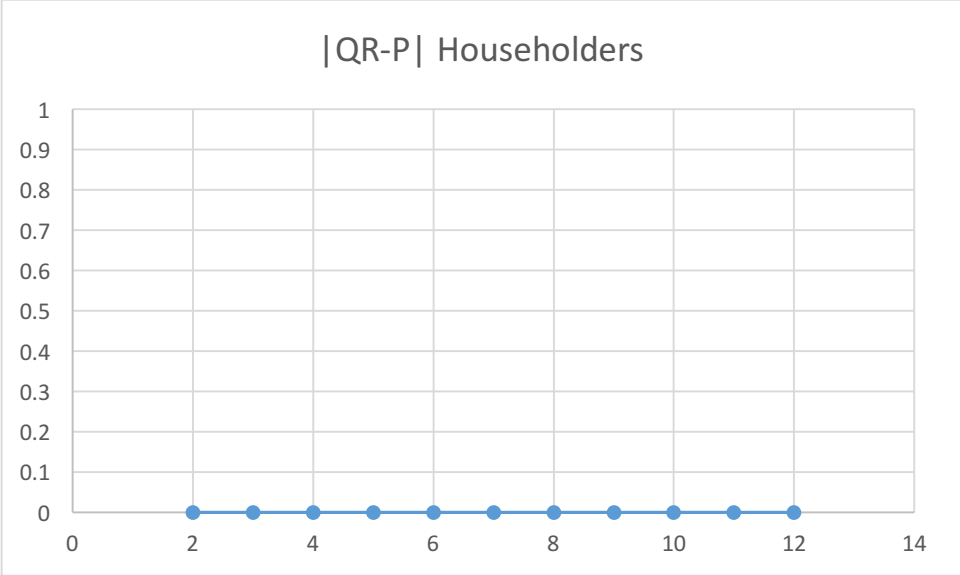

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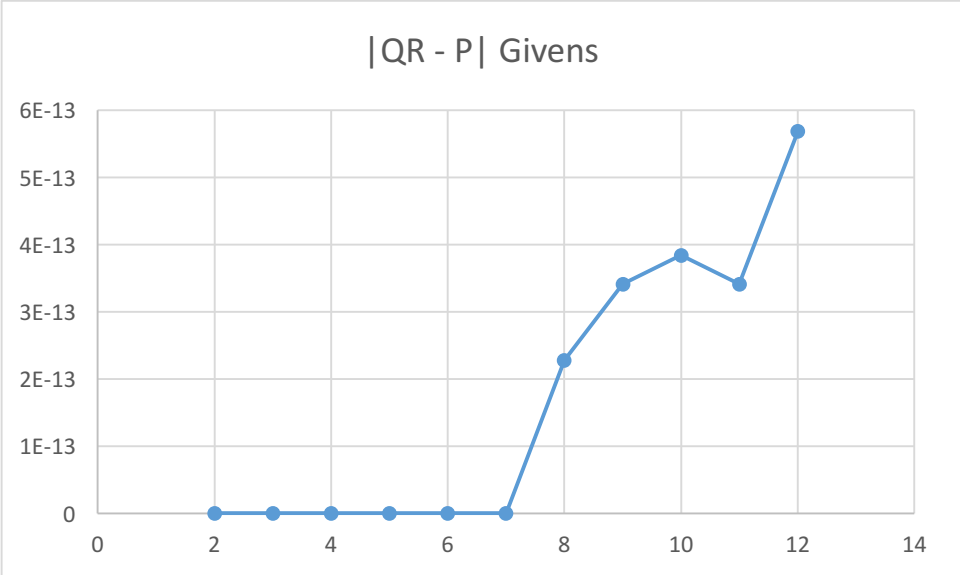

N	LUP	QR-P-G	QR-P-H
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	2.27E-13	0
9	0	3.41E-13	0
10	0	3.84E-13	0
11	0	3.41E-13	0
12	0	5.68E-13	0