**Why is it justified to use the LU or QR-factorizations as opposed of calculating an inverse matrix?**

By separating A into two triangular factors, we can more efficiently find solutions to the system Ax = b through LUx = b. Finding the inverse of a matrix A is computationally expensive. Once we’ve factored A into L and U, we can solve the equation Ax = b much more quickly than repeatedly multiplying A-1 \* b. Once we’ve solved for LU, solving for x is an operation that can be done in O(n2). In contrast, multiplying the inverse of A by b for each problem would result in an operation that would take O(n3).

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

When decomposing A into factored matrices of L and U, or Q and R, we solve the system Ax = b more efficiently. We can see this by the comparing the condition numbers. Simply multiplying b by the inverse of A can yield much different values for the solution x. LU and QR are less sensitive to small changes in the vector we wish to solve for (b) and will produce similar solutions x for these small changes.