**Discussion Questions:**

(I) Why is it justified to modify the algorithm to set β to β − R−1Q⊤r?

We know: β = β − (J⊤J)−1J⊤r and J = Q\*R (by householder or given rotations)

J⊤ = (QR) ⊤ = R ⊤ Q⊤

J⊤J = (R ⊤ Q⊤)\*(QR) = R⊤ \*R

(J⊤J)−1J⊤ = (R−1R⊤\*-1)\*(R ⊤ Q⊤) = R−1 Q⊤

(J⊤J)−1J⊤r = R−1Q⊤r, end of prove.

(II) What is the benefit of modifying the algorithm in this way?

When we use QR-factorization to solve Ax=b, we decouple the problem into two parts. One of them is Qy=b, which has no error amplification, the other one Rx=y, which has the minimal possible error amplification allowed by the inherent error amplification of the original problem.