Part 1)

1. This modification can be understood in the “First Added Note.” This notes sates that after one iteration, Beta will equate to Beta minus x, such that x is equal to R-inverse times Q-transpose times r. This shows convergence.

The original formula states that:

β = β – x

and

x = R-1QTr.

This allows for a modification using substitution such that:

β = β – R-1QTr.

This modification can also be explained in the derivation from Newton’s original method. The gauss-newton method is β = β - (JTJ)-1JTr. You can plug in QR for J and simplify to get β = β – R-1QTr.

1. Because the conditional number of A is equivalent to the conditional number of R (Cond(A) = Cond(R)), no error is added when computing the updated Beta matrix and solution. The conditional number of Q is equal to 1 (Cond(Q) = 1), so factoring a matrix into Q and R will not add error to the final solution