2. Stopping Criterion

Let U^k be the iteration steps of a Jacobi or Gauss-Seidel method for the system $AU = F$ and assume that A is the matrix of a stable finite difference method.

1. In general, we cannot calculate the error $\|U - U^k\|$ because we don't know the correct solution U. Find a computable upper bound for this error that may involve one unknown constant independent of U^k, U, F or the initial value.

   Hint: Recall the definition of stability. How can this help?

2. With an upper bound for the error, we can guarantee that the iterates U^k are sufficiently accurate. Can this also guarantee that we do not iterate for too long and thus waste computational resources?