1. True/False: Determine which of the following statements are true. For each true statement, give a proof and for each false statement produce a counterexample.

   (a) Every linear operator on an $n$-dimensional complex vector space has $n$ distinct eigenvalues.

   (b) Eigenvalues must be nonzero scalars.

   (c) Any two eigenvectors are linearly independent.

   (d) The sum of two eigenvalues of a linear operator $T$ is also an eigenvalue of $T$.