Multiple choice questions are worth 10 points each. No partial credit will be given for a wrong answer to one of these, but you must briefly explain your answers.

1. For an \( n \times n \) Hermitian matrix, non-degenerate eigenvectors
   (a) are always orthogonal to each other.
   (b) are always real.
   (c) are always normalized so that their absolute values are 1.
   (d) can equal 0 if the rank of the matrix is less than \( n \).

2. \( M \) is an \( n \times n \) matrix and \( r \) is a vector of length \( n \). The equation \( Mr = 0 \)
   (a) has an infinite number of solutions if \( \text{rank}(M) < n \).
   (b) has only one solution if \( \text{rank}(M) = n \).
   (c) has an infinite number of solutions if \( \det(M) = 0 \).
   (d) All of the above
   (e) None of the above

Boas Chapter 3, 7.9, 7.17, 7.23, 11.42 (You don’t have to do the last part of multiplying out \( U^{-1}HU \)).