2018 Fall EECS205002 Linear Algebra

Name: ID:

2019/1/09 Quiz 8

1. (7 points) For an $n \times n$ matrix A, list all statements you know that are equivalent to "A is non-singular".

2. (3 points) What are the special properties of eigenvalues/eigenvectors of real symmetric matrices? comparing to the eigenvalues/eigenvectors of general matrices.

3. (2 points) What is the geometrical meaning of the matrix $I - 2\vec{u}\vec{u}^T$? You may explain it using a simple drawing.

4. (5 points) For $A = \begin{bmatrix} 1 & 0 & 0 \\ -2 & 1 & -3 \\ 1 & 1 & -1 \end{bmatrix}$.

   (a) Let $p(\lambda) = a_3\lambda^3 + a_2\lambda^2 + a_1\lambda + a_0$ be the characteristic polynomial of A? What is a_2, a_0 and $p(A)$?

   (b) What is the eigenvector belonging to the eigenvalue $\lambda = 1$.

5. (3 points) Show that if $A = A^T$ and $A^T A = I$, then all eigenvalues of A are 1 or -1.