Multiple-Choice Test

Chapter 4.10
Eigenvalues and Eigenvectors

1. The eigenvalues of
$$\begin{bmatrix} 5 & 6 & 17 \\ 0 & -19 & 23 \\ 0 & 0 & 37 \end{bmatrix}$$
are

(A) $-19,5,37$
(B) $19,-5,-37$
(C) $2,-3,7$
(D) $3,-5,37$

2. If $\begin{bmatrix} -4.5 \\ -4 \\ 1 \end{bmatrix}$ is an eigenvector of $\begin{bmatrix} 8 & -4 & 2 \\ 4 & 0 & 2 \\ 0 & -2 & -4 \end{bmatrix}$, the eigenvalue corresponding to the eigenvector is

(A) 1
(B) 4
(C) -4.5
(D) 6

3. The eigenvalues of the following matrix
$$\begin{bmatrix} 3 & 2 & 9 \\ 7 & 5 & 13 \\ 6 & 17 & 19 \end{bmatrix}$$
are given by solving the cubic equation

(A) $\lambda^3 - 27\lambda^2 + 167\lambda - 285$
(B) $\lambda^3 - 27\lambda^2 - 122\lambda - 313$
(C) $\lambda^3 + 27\lambda^2 + 167\lambda + 285$
(D) $\lambda^3 + 23.23\lambda^2 - 158.3\lambda + 313$

4. The eigenvalues of a 4×4 matrix $[A]$ are given as $2,-3,13$, and 7. The $|\det(A)|$ then is
   (A) 546
   (B) 19
   (C) 25
   (D) cannot be determined

5. If one of the eigenvalues of $[A]_{n\times n}$ is zero, it implies
   (A) The solution to $[A][X]=[C]$ system of equations is unique
   (B) The determinant of $[A]$ is zero
   (C) The solution to $[A][X]=[0]$ system of equations is trivial
   (D) The determinant of $[A]$ is nonzero

6. Given that matrix $[A]=\begin{bmatrix}8 & -4 & 2\\ 4 & 0 & 2\\ 0 & -2 & -3\end{bmatrix}$ has an eigenvalue value of 4 with the corresponding eigenvectors of $[x]=\begin{bmatrix}-4.5\\ -4\\ 1\end{bmatrix}$, then $[A]^5[X]$ is

   (A) $\begin{bmatrix}-18\\ -16\\ 4\end{bmatrix}$

   (B) $\begin{bmatrix}-4.5\\ -4\\ 1\end{bmatrix}$

   (C) $\begin{bmatrix}-4608\\ -4096\\ 1024\end{bmatrix}$

   (D) $\begin{bmatrix}-0.004395\\ -0.003906\\ 0.0009766\end{bmatrix}$