WebAssign
CH 7.1 (Homework)

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MA 265 Spring 2013, section 132, Spring 2013
Instructor: Alexandre Eremenko

Current Score : 20 / 20 **Due :** Thursday, April 11 2013 11:40 PM EDT

The due date for this assignment is past. Your work can be viewed below, but no changes can be made.

Important! Before you view the answer key, decide whether or not you plan to request an extension. Your Instructor may *not* grant you an extension if you have viewed the answer key. Automatic extensions are not granted if you have viewed the answer key.

Request Extension View Key

1. 3.33/3.33 points | Previous Answers KolmanLinAlg9 7.1.005.

Find the characteristic polynomial of each of the following matrices.

(a) $\begin{bmatrix} 4 & 1 \\ -1 & 3 \end{bmatrix}$

$p(\lambda) =$

(b) $\begin{bmatrix} 1 & 5 & 1 \\ 0 & 1 & 2 \\ -1 & 3 & 2 \end{bmatrix}$

$p(\lambda) =$

(c) $\begin{bmatrix} 5 & -1 & 3 \\ 0 & 2 & 1 \\ 0 & 0 & 4 \end{bmatrix}$

$p(\lambda) =$

(d) $\begin{bmatrix} 4 & 2 \\ 3 & 3 \end{bmatrix}$

$p(\lambda) =$

2. 3.33/3.33 points | Previous Answers KolmanLinAlg9 7.1.006.

Find the characteristic polynomial, the eigenvalues, and associated eigenvectors of each of the following matrices. (If an answer does not exist, enter DNE. For each subpart, enter the answers that exist first. Repeated eigenvalues should be entered repeatedly with the same eigenvectors.)

(a) $\begin{bmatrix} 2 & 2 \\ 2 & 2 \end{bmatrix}$

$p(\lambda)$ =

$\lambda_1 = \boxed{0}$ $\mathbf{x}_1 = \begin{bmatrix} -1 \\ 1 \end{bmatrix}$ (smaller λ-value)

$\lambda_2 = \boxed{4}$ $\mathbf{x}_2 = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ (larger λ-value)

(b) $\begin{bmatrix} 1 & 0 & 0 \\ -1 & 3 & 0 \\ 3 & 2 & -2 \end{bmatrix}$

$p(\lambda)$ =

$\lambda_1 = \boxed{-2}$ $\mathbf{x}_1 = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$ (smallest λ-value)

$\lambda_2 = \boxed{1}$ $\mathbf{x}_2 = \begin{bmatrix} 6 \\ 3 \\ 8 \end{bmatrix}$

$\lambda_3 = \boxed{3}$ $\mathbf{x}_3 = \begin{bmatrix} 0 \\ 5 \\ 2 \end{bmatrix}$ (largest λ-value)

(c) $\begin{bmatrix} 0 & 1 & 5 \\ 0 & 0 & 3 \\ 0 & 0 & 0 \end{bmatrix}$

$p(\lambda) =$

$\lambda_1 = \boxed{0}$ $\mathbf{x}_1 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$ (smallest λ-value)

$\lambda_2 = \boxed{0}$ $\mathbf{x}_2 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$

$\lambda_3 = \boxed{0}$ $\mathbf{x}_3 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$ (largest λ-value)

(d) $\begin{bmatrix} 2 & 1 & 2 \\ 1 & 1 & -1 \\ 3 & 1 & 1 \end{bmatrix}$

$p(\lambda) =$

$\lambda_1 = \boxed{-1}$ $\mathbf{x}_1 = \begin{bmatrix} 1 \\ \\ \end{bmatrix}$ (smallest λ-value)

$\lambda_2 = \boxed{1}$ $\mathbf{x}_2 = \begin{bmatrix} 1 \\ \\ \end{bmatrix}$

$\lambda_3 = \boxed{4}$ $\mathbf{x}_3 = \begin{bmatrix} 1 \\ \\ \end{bmatrix}$ (largest λ-value)

3. 3.33/3.33 points | Previous Answers KolmanLinAlg9 7.1.007.

Find the characteristic polynomial, the eigenvalues, and associated eigenvectors of each of the following matrices. (If an answer does not exist, enter DNE. For each subpart, enter the answers that exist first. Repeated eigenvalues should be entered repeatedly with the same eigenvectors.)

(a) $\begin{bmatrix} 1 & -1 \\ 2 & 4 \end{bmatrix}$

$p(\lambda) =$

$\lambda_1 = \boxed{2}$ $\mathbf{x}_1 = \begin{bmatrix} 1 \\ \end{bmatrix}$ (smaller λ-value)

$\lambda_2 = \boxed{3}$ $\mathbf{x}_2 = \begin{bmatrix} 1 \\ \end{bmatrix}$ (larger λ-value)

(b) $\begin{bmatrix} 2 & -2 & 4 \\ 0 & 3 & -2 \\ 0 & -1 & 2 \end{bmatrix}$

$p(\lambda) =$

$\lambda_1 = \boxed{1}$ $\mathbf{x}_1 = \begin{bmatrix} 1 \\ \\ \end{bmatrix}$ (smallest λ-value)

$\lambda_2 = \boxed{2}$ $\mathbf{x}_2 = \begin{bmatrix} 1 \\ \\ \end{bmatrix}$

$\lambda_3 = \boxed{4}$ $\mathbf{x}_3 = \begin{bmatrix} 1 \\ \\ \end{bmatrix}$ (largest λ-value)

(c) $\begin{bmatrix} 2 & 2 & 3 \\ 1 & 2 & 1 \\ 2 & -2 & 1 \end{bmatrix}$

$p(\lambda) =$

$\lambda_1 = \boxed{-1}$ $\mathbf{x}_1 = \begin{bmatrix} 1 \\ \\ \end{bmatrix}$ (smallest λ-value)

$\lambda_2 = \boxed{2}$ $\mathbf{x}_2 = \begin{bmatrix} 1 \\ \\ \end{bmatrix}$

$\lambda_3 = \boxed{4}$ $\mathbf{x}_3 = \begin{bmatrix} 1 \\ \\ \end{bmatrix}$ (largest λ-value)

(d) $\begin{bmatrix} -2 & -2 & 4 \\ 0 & 3 & -2 \\ 0 & -1 & 2 \end{bmatrix}$

$p(\lambda) =$

$\lambda_1 = \boxed{-2}$ $\mathbf{x}_1 = \begin{bmatrix} 1 \\ \\ \end{bmatrix}$ (smallest λ-value)

$\lambda_2 = \boxed{1}$ $\mathbf{x}_2 = \begin{bmatrix} 1 \\ \\ \end{bmatrix}$

$\lambda_3 = \boxed{4}$ $\mathbf{x}_3 = \begin{bmatrix} 1 \\ \\ \end{bmatrix}$ (largest λ-value)

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4. 3.33/3.33 points | Previous Answers KolmanLinAlg9 7.1.008.

Find all the eigenvalues and associated eigenvectors of each of the following matrices. (If an answer does not exist, enter DNE. For each subpart, enter the answers that exist first. Repeated eigenvalues should be entered repeatedly with the same eigenvectors.)

(a) $\begin{bmatrix} 1 & 6 \\ 3 & -2 \end{bmatrix}$

$\lambda_1 = \boxed{-5}$ $\quad \mathbf{x}_1 = \begin{bmatrix} 1 \\ \end{bmatrix}$ (smaller λ-value)

$\lambda_2 = \boxed{4}$ $\quad \mathbf{x}_2 = \begin{bmatrix} 1 \\ \end{bmatrix}$ (larger λ-value)

(b) $\begin{bmatrix} 0 & -4 \\ 1 & 0 \end{bmatrix}$

$\lambda_1 = \boxed{\text{dne}}$ $\quad \mathbf{x}_1 = \begin{bmatrix} \text{dne} \\ \end{bmatrix}$ (smaller λ-value)

$\lambda_2 = \boxed{\text{dne}}$ $\quad \mathbf{x}_2 = \begin{bmatrix} \text{dne} \\ \end{bmatrix}$ (larger λ-value)

(c) $\begin{bmatrix} 4 & 2 & -4 \\ 1 & 5 & -4 \\ 0 & 0 & 6 \end{bmatrix}$

$\lambda_1 = \boxed{3}$ $\quad \mathbf{x}_1 = \begin{bmatrix} 1 \\ \\ \end{bmatrix}$ (smallest λ-value)

$\lambda_2 = \boxed{6}$ $\quad \mathbf{x}_2 = \begin{bmatrix} 1 \\ \\ \end{bmatrix}$

$\lambda_3 = \boxed{6}$ $\mathbf{x}_3 = \begin{bmatrix} 1 \\ \\ \end{bmatrix}$ (largest λ-value)

(d) $\begin{bmatrix} 0 & -2 & 0 \\ 2 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$

$\lambda_1 = \boxed{0}$ $\mathbf{x}_1 = \begin{bmatrix} 1 \\ \\ \end{bmatrix}$ (smallest λ-value)

$\lambda_2 = \boxed{\text{dne}}$ $\mathbf{x}_2 = \begin{bmatrix} \text{dne} \\ \\ \end{bmatrix}$

$\lambda_3 = \boxed{\text{dne}}$ $\mathbf{x}_3 = \begin{bmatrix} \text{dne} \\ \\ \end{bmatrix}$ (largest λ-value)

5. 3.33/3.33 points | Previous Answers KolmanLinAlg9 7.1.017.

Let λ be an eigenvalue of the $n \times n$ matrix A. The subset of R^n (C^n) consisting of the zero vector and all eigenvectors of A associated with λ is a subspace of R^n (C^n). This subspace is called the **eigenspace** associated with λ.

Find a basis for the eigenspace associated with λ for each given matrix.

(a) $\begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}, \lambda = 1$

1	0
0	1
1	0

(b) $\begin{bmatrix} 7 & 1 & 0 \\ 1 & 7 & 1 \\ 0 & 1 & 7 \end{bmatrix}, \lambda = 7$

−1
0
1

6. 3.35/3.35 points | Previous Answers KolmanLinAlg9 7.1.018.

Let λ be an eigenvalue of the $n \times n$ matrix A. The subset of R^n (C^n) consisting of the zero vector and all eigenvectors of A associated with λ is a subspace of R^n (C^n). This subspace is called the **eigenspace** associated with λ.

Find a basis for the eigenspace associated with λ for each given matrix.

(a) $\begin{bmatrix} 2 & 0 & 0 \\ -2 & 2 & -2 \\ 2 & 0 & 4 \end{bmatrix}$, $\lambda = 2$

−1	0
0	1
1	0

(b) $\begin{bmatrix} 4 & 2 & 0 & 0 \\ 3 & 3 & 0 & 0 \\ 0 & 0 & 2 & 5 \\ 0 & 0 & 0 & 2 \end{bmatrix}$, $\lambda = 2$

0
0
1
0