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Date: 7/1/21　　　　　　　　　　**Course:** Linear Algebra

1.
Is $\mathbf{v} = \begin{bmatrix} 6 \\ 5 \end{bmatrix}$ an eigenvector of $A = \begin{bmatrix} -3 & 6 \\ -5 & 8 \end{bmatrix}$? If so, find the eigenvalue.

Select the correct choice below and, if necessary, fill in the answer box within your choice.

✔ **A.** Yes, $\mathbf{v}$ is an eigenvector of A. The eigenvalue is $\lambda =$ ___2___ .

○ **B.** No, $\mathbf{v}$ is not an eigenvector of A.

2.
Is $\lambda = 2$ an eigenvalue of $\begin{bmatrix} 1 & 0 & 2 \\ 3 & 1 & -4 \\ -2 & 4 & -2 \end{bmatrix}$? If so, find one corresponding eigenvector.

Select the correct choice below and, if necessary, fill in the answer box within your choice.

Yes, $\lambda = 2$ is an eigenvalue of $\begin{bmatrix} 1 & 0 & 2 \\ 3 & 1 & -4 \\ -2 & 4 & -2 \end{bmatrix}$. One corresponding eigenvector is

✔ **A.** $\begin{bmatrix} 2 \\ 2 \\ 1 \end{bmatrix}$.

(Type a vector or list of vectors. Type an integer or simplified fraction for each matrix element.)

○ **B.** No, $\lambda = 2$ is not an eigenvalue of $\begin{bmatrix} 1 & 0 & 2 \\ 3 & 1 & -4 \\ -2 & 4 & -2 \end{bmatrix}$.

3. Find the eigenvalues of the matrix.

$\begin{bmatrix} 0 & 0 & 0 \\ 0 & -3 & 3 \\ 0 & 0 & 2 \end{bmatrix}$

The eigenvalue(s) of the matrix is/are ___0, -3,2___ .
(Use a comma to separate answers as needed.)

4. Find the characteristic polynomial and the eigenvalues of the matrix.

$$\begin{bmatrix} 4 & 2 \\ 2 & 4 \end{bmatrix}$$

The characteristic polynomial is $\lambda^2 - 8\lambda + 12$.

(Type an expression using λ as the variable. Type an exact answer, using radicals as needed.)

Select the correct choice below and, if necessary, fill in the answer box within your choice.

✅ **A.** The real eigenvalue(s) of the matrix is/are   2,6   .
(Type an exact answer, using radicals as needed. Use a comma to separate answers as needed. Type each answer only once.)

⭕ **B.** The matrix has no real eigenvalues.

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5. Find the characteristic polynomial and the eigenvalues of the matrix.

$$\begin{bmatrix} -9 & -4 \\ 4 & -6 \end{bmatrix}$$

The characteristic polynomial is $\lambda^2 + 15\lambda + 70$.

(Type an expression using λ as the variable. Type an exact answer, using radicals as needed.)

Select the correct choice below and, if necessary, fill in the answer box within your choice.

⭕ **A.** The real eigenvalue(s) of the matrix is/are   .
(Type an exact answer, using radicals as needed. Use a comma to separate answers as needed. Type each answer only once.)

✅ **B.** The matrix has no real eigenvalues.

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6. Find the characteristic polynomial of the matrix, using either a cofactor expansion or the special formula for 3×3 determinants. [Note: Finding the characteristic polynomial of a 3×3 matrix is not easy to do with just row operations, because the variable λ is involved.]

$$\begin{bmatrix} 0 & 3 & 1 \\ 3 & 0 & 2 \\ 1 & 2 & 0 \end{bmatrix}$$

The characteristic polynomial is $-\lambda^3 + 14\lambda + 12$.

(Type an expression using λ as the variable.)

YOU ANSWERED: $-\lambda^3 + 9\lambda + 12$

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7. For the matrix, list the real eigenvalues, repeated according to their multiplicities.

$$\begin{bmatrix} 6 & -4 & 0 & 7 \\ 0 & 6 & 4 & 9 \\ 0 & 0 & 4 & 9 \\ 0 & 0 & 0 & 7 \end{bmatrix}$$

The real eigenvalues are   4,6,6,7   .

(Use a comma to separate answers as needed.)