Assignment WW-Eigenvalues

1. (1 point) If $\vec{v}_1 = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$ and $\vec{v}_2 = \begin{bmatrix} 3 \\ 5 \end{bmatrix}$ are eigenvectors of a matrix A corresponding to the eigenvalues $\lambda_1 = 1$ and $\lambda_2 = 6$, respectively,

then $A(\vec{v}_1 + \vec{v}_2) = \begin{bmatrix} \_\_ \\ \_\_ \end{bmatrix}$

and $A(-2\vec{v}_1) = \begin{bmatrix} \_\_ \\ \_\_ \end{bmatrix}$

Correct Answers:

- $\begin{bmatrix} 19 \\ 32 \end{bmatrix}$
- $\begin{bmatrix} -2 \\ -4 \end{bmatrix}$

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2. (1 point) Find the characteristic polynomial of the matrix

$$A = \begin{bmatrix} -4 & 1 & 0 \\ 0 & 1 & 5 \\ 4 & -2 & 0 \end{bmatrix}.$$

$p(x) =$ ________________.

Correct Answers:

- `x^3+3*x^2+6*x+20`

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3. (1 point) Given that $\vec{v}_1 = \begin{bmatrix} -3 \\ 1 \end{bmatrix}$ and $\vec{v}_2 = \begin{bmatrix} -8 \\ 3 \end{bmatrix}$ are eigenvectors of the matrix

$$A = \begin{bmatrix} -62 & -168 \\ 21 & 57 \end{bmatrix}$$

determine the corresponding eigenvalues.

$\lambda_1 =$ ___.
$\lambda_2 =$ ___.

Correct Answers:

- `-6`
- `1`

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4. (1 point) Find the eigenvalues of the matrix

$$C = \begin{bmatrix} -11 & 8 & -14 \\ 10 & -9 & 14 \\ 13 & -8 & 16 \end{bmatrix}.$$

The eigenvalues are __________.
(Enter your answers as a comma separated list. The list you enter should have repeated items if there are eigenvalues with multiplicity greater than one.)

Correct Answers:

- `-5, -1, 2`

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5. (1 point) Find the eigenvalues and eigenvectors of the matrix

$$\begin{bmatrix} 3 & 0 & 0 \\ 7 & -4 & 0 \\ 10 & -4 & 0 \end{bmatrix}.$$

From smallest to largest, the eigenvalues are $\lambda_1 < \lambda_2 < \lambda_3$ where

$\lambda_1 =$ ___ has an eigenvector $\begin{bmatrix} \_\_ \\ \_\_ \\ \_\_ \end{bmatrix}$,

$\lambda_2 =$ ___ has an eigenvector $\begin{bmatrix} \_\_ \\ \_\_ \\ \_\_ \end{bmatrix}$,

$\lambda_3 =$ ___ has an eigenvector $\begin{bmatrix} \_\_ \\ \_\_ \\ \_\_ \end{bmatrix}$.

Note: you may want to use a graphing calculator to estimate the roots of the polynomial which defines the eigenvalues.

Correct Answers:

- `-4`
- $\begin{bmatrix} 0 \\ -1 \\ -1 \end{bmatrix}$
- `0`
- $\begin{bmatrix} 0 \\ 0 \\ -1 \end{bmatrix}$
- `3`
- $\begin{bmatrix} -1 \\ -1 \\ -2 \end{bmatrix}$