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1. (1 point)
Find the area of the parallelogram with vertices at $(0,0)$, $(11,8)$, $(12,0)$, and $(23,8)$.

Area = ________.

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2. (1 point)
Find the area of the parallelogram with vertices at $(5,-3)$, $(-3,-12)$, $(12,2)$, and $(4,-7)$.

Area = ________.

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3. (1 point) Given that $\vec{v}_1 = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$ and $\vec{v}_2 = \begin{bmatrix} -2 \\ 1 \end{bmatrix}$ are eigenvectors of the matrix

$$A = \begin{bmatrix} 11 & 12 \\ -6 & -7 \end{bmatrix}$$

determine the corresponding eigenvalues.

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

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4. (1 point)
Determine if v is an eigenvector of the matrix A.

$\boxed{?}$1. $A = \begin{bmatrix} 0.999999999999996 & -3 \\ 10 & -10 \end{bmatrix}$, $v = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$

$\boxed{?}$2. $A = \begin{bmatrix} 12 & 4 \\ -12 & -2 \end{bmatrix}$, $v = \begin{bmatrix} 1 \\ -2 \end{bmatrix}$

$\boxed{?}$3. $A = \begin{bmatrix} 34 & 14 \\ -70 & -29 \end{bmatrix}$, $v = \begin{bmatrix} 2 \\ 7 \end{bmatrix}$

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5. (1 point)
Determine if λ is an eigenvalue of the matrix A.

$\boxed{?}$1. $A = \begin{bmatrix} 4 & -6 \\ 9 & -11 \end{bmatrix}$ and $\lambda = -2$

$\boxed{?}$2. $A = \begin{bmatrix} 27 & 10 \\ -50 & -18 \end{bmatrix}$ and $\lambda = 7$

$\boxed{?}$3. $A = \begin{bmatrix} 24 & 27 \\ -18 & -21 \end{bmatrix}$ and $\lambda = 5$

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6. (1 point) The matrix

$$A = \begin{bmatrix} -10 & -6 & 3 \\ 8 & 4 & -4 \\ -2 & -2 & -3 \end{bmatrix}$$

has eigenvalue $\lambda = -4$ with an eigenspace of dimension 2.

Find a basis for the -4-eigenspace: $\left\{ \begin{bmatrix} \_\_ \\ \_\_ \\ \_\_ \end{bmatrix}, \begin{bmatrix} \_\_ \\ \_\_ \\ \_\_ \end{bmatrix} \right\}$

(The eigenvalues of A are $\lambda = -4, -4, -1$.)

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7. (1 point) Find the characteristic polynomial of the matrix

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

Please enter the polynomial in terms of the variable x instead of the variable λ. If you found the polynomial to be $\lambda^3 + 2\lambda - 1$, you should type "$x^3 + 2x - 1$".

$p(x) =$ ____________________.

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8. (1 point) Find the eigenvalues of the matrix

$$A = \begin{bmatrix} 6 & 12 \\ -1 & -1 \end{bmatrix}$$

The eigenvalues are __________.
(Enter your answers as a comma separated list.)

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9. (1 point) Find the three distinct real eigenvalues of the matrix

$$B = \begin{bmatrix} -8 & 3 & -5 \\ 0 & 8 & 5 \\ 0 & 0 & -4 \end{bmatrix}.$$

The eigenvalues are __________. (Enter your answers as a comma separated list.)

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10. (1 point)
Let $A = \begin{bmatrix} -9 & 6 \\ 9 & k \end{bmatrix}$.
For A to have 0 as an eigenvalue, k must be ___