Problem 1. **(1 point)**

Consider the matrix $A = \begin{bmatrix} -4 & 14 \\ -3 & 9 \end{bmatrix}$, and the matrices

$$S = \begin{bmatrix} 11.5 & 3 \\ 7 & 2 \end{bmatrix}, \quad T = \begin{bmatrix} 7 & 2 \\ 3 & 1 \end{bmatrix}, \quad \text{and} \quad U = \begin{bmatrix} 5 & 2 \\ 2 & 1 \end{bmatrix}.$$

Which of these diagonalize A?

A is diagonalized by [?/S/T/U]

It may be useful to note that

$$S^{-1} = \begin{bmatrix} 1 & -1.5 \\ -3.5 & 5.75 \end{bmatrix}, \quad T^{-1} = \begin{bmatrix} 1 & -2 \\ -3 & 7 \end{bmatrix}, \quad \text{and} \quad U^{-1} = \begin{bmatrix} 1 & -2 \\ -2 & 5 \end{bmatrix}.$$

What is the diagonal matrix?

$B = \begin{bmatrix} \_\_ & \_\_ \\ \_\_ & \_\_ \end{bmatrix}$

Answer(s) submitted:

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

submitted: (correct)
recorded: (correct)

Problem 2. **(1 point)**

Consider the matrix $A = \begin{bmatrix} 2 & 4 \\ 4 & 2 \end{bmatrix}$. Which of the following are eigenvectors of the matrix?

$$(1): \vec{v} = \begin{bmatrix} 2 \\ 1 \end{bmatrix}, \quad (2): \vec{v} = \begin{bmatrix} 2 \\ 3 \end{bmatrix}, \quad (3): \vec{v} = \begin{bmatrix} -2 \\ 2 \end{bmatrix}, \quad (4): \vec{v} = \begin{bmatrix} 2 \\ 2 \end{bmatrix}$$

Eigenenvectors are ________
(Enter an ordered list of numbers corresponding to those which are; for example, if vectors 1 and 3 are eigenvectors, enter **1, 3***.)*

What are the eigenvalues corresponding to these eigenvectors? ________

Answer(s) submitted:

- $3, 4$
- $-2, 6$

submitted: (correct)
recorded: (correct)

Problem 3. **(1 point)**

Suppose that the eigenvectors of a 3×3 matrix A are $\vec{v}_1 = \begin{bmatrix} 1 \\ 3 \\ 3 \end{bmatrix}$, $\vec{v}_2 = \begin{bmatrix} -3 \\ 3 \\ -3 \end{bmatrix}$ and $\vec{v}_3 = \begin{bmatrix} 2 \\ 0 \\ -3 \end{bmatrix}$ with corresponding eigenvalues $\lambda_1 = -3$, $\lambda_2 = -2$, and $\lambda_3 = -3$.

Is A diagonalizable? [?/yes/no]

If it is, what invertible matrix S and diagonal matrix B diagonalize A?

$S = \begin{bmatrix} \_\_ & \_\_ & \_\_ \\ \_\_ & \_\_ & \_\_ \\ \_\_ & \_\_ & \_\_ \end{bmatrix}$

$B = \begin{bmatrix} \_\_ & \_\_ & \_\_ \\ \_\_ & \_\_ & \_\_ \\ \_\_ & \_\_ & \_\_ \end{bmatrix}$

(Enter both S and B before submitting. If no such S and B exist, enter zeros for all entries in both matrices.)

Answer(s) submitted:

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

submitted: (correct)
recorded: (correct)