Linear Algebra
Quiz 10

Name:______________________________

You have 10 minutes to complete this quiz. If you have a question raise your hand and remain seated. In order to receive full credit your answer must be **complete**, **legible** and **correct**. Show your work, and give adequate explanations.

1. Find the characteristic polynomial of the matrix $A = \begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix}$.

$$\chi_A(\lambda) = \det(\lambda I - A) = \det\left(\begin{bmatrix} \lambda - 1 & -2 \\ -2 & \lambda - 4 \end{bmatrix}\right) = \lambda^2 - 5\lambda.$$

2. Find the eigenvalues of A.

$\chi_A(\lambda) = \lambda^2 - 5\lambda = \lambda(\lambda - 5)$, so $\lambda = 0, 5$ are the e-values.

3. For each eigenvalue of A, find an associated eigenvector.

For $\lambda = 0$, we want a vector $\mathbf{v} \neq \mathbf{0}$ such that $(A - 0I)\mathbf{v} = A\mathbf{v} = \mathbf{0}$. The nullspace algorithm yields $\mathbf{v} = \begin{bmatrix} 2 \\ -1 \end{bmatrix}$ as a candidate.

For $\lambda = 5$, we want a vector $\mathbf{v} \neq \mathbf{0}$ such that $(A - 5I)\mathbf{v} = \begin{bmatrix} -4 & 2 \\ 2 & -1 \end{bmatrix}\mathbf{v} = \mathbf{0}$. The nullspace algorithm yields $\mathbf{v} = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$ as a candidate.