Facts to Know:

$A$ is an $n \times n$ matrix:

- $\lambda$ is an eigenvalue of $A$ if there is a vector $\vec{v}$ such that $A\vec{v} = \lambda \vec{v}$.
- Such $\vec{v}$ is called an eigenvector of $A$ corresponding to eigenvalue $\lambda$.
- $\lambda$ is an eigenvalue if and only if $\det(A - \lambda I) = 0$.
- The set of all solutions to $A\vec{v} = \lambda \vec{v}$ is called the eigenspace of $A$ corresponding to $\lambda$.

Examples:

1. Let $A = \begin{bmatrix} 5 & 2 \\ 1 & 4 \end{bmatrix}$, find all eigenvalues, and for each eigenvalue, find a basis for the corresponding eigenspace.