

Instructions: Clearly answer each of the questions below. Remember to check the back side. Show your work and any formulas you employ. Simplify all answers as far as possible.

1. (1 pt) Calculate $\begin{bmatrix} 3 & 0 \\ 0 & -1 \end{bmatrix}^4$.

$$\underline{\underline{\begin{bmatrix} 81 & 0 \\ 0 & 1 \end{bmatrix}^4}}$$

2. (2 pts) Find the inverse of $\begin{bmatrix} 2 & 2 \\ 7 & 8 \end{bmatrix}$.

$$\underline{\underline{\frac{1}{2} \begin{bmatrix} 8 & -2 \\ -7 & 2 \end{bmatrix}}}$$

3. (2 pts) Find the eigenvalues of $A = \begin{bmatrix} 13 & -8 \\ 24 & -15 \end{bmatrix}$.

$$\underline{\underline{\lambda \in \{-3, 1\}}}$$

4. (3 pts) Given that $[1, 1]$ and $[2, 3]$ are eigenvectors of $A = \begin{bmatrix} -19 & 14 \\ -21 & 16 \end{bmatrix}$,

find invertible P and diagonal D so $A = PDP^{-1}$.

Since you are given the eigenvectors, you can calculate the eigenvalues directly as $\lambda = \|Av\|/\|v\|$, without having to use the characteristic equation.

$$\underline{\underline{P = \begin{bmatrix} 1 & 2 \\ 1 & 3 \end{bmatrix}}}$$

$$\underline{\underline{D = \begin{bmatrix} -5 & 0 \\ 0 & 2 \end{bmatrix}}}$$