

1. Find the eigenvalues and eigenvectors of the matrix  $A = \begin{bmatrix} 3 & -1 \\ 4 & -2 \end{bmatrix}$ .
2. Let  $P$  be the  $2 \times 2$  matrix whose columns are the two eigenvectors. Find the inverse matrix  $P^{-1}$  using

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix} \implies A^{-1} = \frac{1}{ad - bc} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}.$$

**Leave the fraction  $\frac{1}{ad - bc}$  out of the matrix.**

3. Compute  $D = P^{-1}AP$ , not multiplying the fraction in until the very end. What kind of a matrix is the result? (The letter used for it is a hint!) What do you notice about its entries?
4. Now compute  $PDP^{-1}$ . Does the result surprise you?