$A = \begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix}$ $C(A) = | A - \lambda I |$ $\begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix} - \lambda \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 1-\lambda & 2 \\ 3 & 2-\lambda \end{bmatrix} = (1-\lambda) * (2-\lambda) - 6$

$= 2 - 3\lambda + \lambda^2 - 6 = \lambda^2 - 3\lambda - 4 = \lambda^2 - 3\lambda - 4 = (\lambda - 4) * (\lambda + 1)$ **Thus λ = 4, -1 or** $\lambda_1 = 4, \ \lambda_2 = -1$

A, P non-singular matrix

A and PAP^{-1} **have the same Eigenvalues.** **A and B are similar if** $A = PBP^{-1}$

1. **Similar matrices have the same Characteristic Polynomials**
2. **Let λ have and Eigenvalue of A and B if A and B are similar, the dim(N(A- λI)) = dim(N(B- λI)).**

PROOF:

$\{V_1, ..., V_k\}$ **is a basis of N(A- λI)** **dim N(A- λI) = K**

There is a P such that $A = PBP^{-1}$.

Since P is non-singular, $PV_1, ..., PV_k$ **are Linearly Independent.**

Then $PV_1, ..., PV_k \in N(B - \lambda I)$

$(B - \lambda I)PV_j = BPV_j - \lambda PV_j$

Remember – from earlier- **A = PBP⁻¹** → $A = PBP^{-1}$ $B = P^{-1}AP$ **AP = PB**

dim N(A - λI) ≤ dim N(B - λI) **and** **dim N(B - λI) ≤ dim N(A - λI)**

<u>Therefore: They are equal.</u>