An example of case 1:

$$A = \begin{bmatrix} 42 & -33 \\ 22 & -13 \end{bmatrix}$$

$$\det(A - \lambda I) = \det \begin{bmatrix} 42-\lambda & -33 \\ 22 & -13-\lambda \end{bmatrix} = 180 - 29\lambda + \lambda^2$$

$$= (20-\lambda)(9-\lambda)$$

⇒ the ~~the~~ eigen values are distinct, $\lambda_1 = 20, \lambda_2 = 9$

Finding corresponding eigen vector

i) For $\lambda_1 = 20$; $A - \lambda_1 I = \begin{bmatrix} 22 & -33 \\ 22 & -33 \end{bmatrix} \rightarrow$ RREF

$$\begin{bmatrix} 1 & -3/2 \\ 0 & 0 \end{bmatrix}$$

so we can take any scalar multiple of ~~the~~ an eigen vector, ⇒ ~~so~~ $\vec{v_1} = \begin{bmatrix} 3 \\ 2 \end{bmatrix}$

$$\Rightarrow A\vec{v_1} = \lambda \vec{v_1} = 20 \begin{bmatrix} 3 \\ 2 \end{bmatrix}$$

Similarly for, λ_2