Example

Consider $\mathbf{Y}' = \begin{bmatrix} 2 & 2 \\ 1 & 3 \end{bmatrix} \mathbf{Y}$

Answer the following:

1. Write the characteristic equation:
2. Verify that $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$ is an eigenvector.
3. Given that $\lambda_2 = 1, \mathbf{v}_2 = \begin{bmatrix} -2 \\ 1 \end{bmatrix}$ is the other, write the general solution to the DE:

Example

Consider $\mathbf{Y}' = \begin{bmatrix} 2 & 2 \\ 1 & 3 \end{bmatrix} \mathbf{Y}$

Answer the following:

1. Write the characteristic equation:

$$\begin{vmatrix} (2-\lambda) & 2 \\ 1 & (3-\lambda) \end{vmatrix} = 0 \quad \Rightarrow$$

$$\lambda^2 - 5\lambda + (6-2) = 0 \quad \Rightarrow \quad \lambda^2 - 5\lambda + 4 = 0$$

Example

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Answer the following:

1. Write the characteristic equation:
2. Verify that $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$ is an eigenvector.

   Check that $A\mathbf{v} = \lambda \mathbf{v}$ (for some λ):

$$\begin{bmatrix} 2 & 2 \\ 1 & 3 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \end{bmatrix} = \begin{bmatrix} 4 \\ 4 \end{bmatrix} = 4 \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

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Answer the following:

1.
2.
3. Given that $\lambda_2 = 1, \mathbf{v}_2 = \begin{bmatrix} -2 \\ 1 \end{bmatrix}$ is the other, write the general solution to the DE:

$$Y(t) = C_1 e^{4t} \begin{bmatrix} 1 \\ 1 \end{bmatrix} + C_2 e^{t} \begin{bmatrix} -2 \\ 1 \end{bmatrix}$$