Chapter 7

Chapter 7

Let's find solutions to:

$$\begin{pmatrix} x_1'(t) \\ x_2'(t) \end{pmatrix} = \begin{pmatrix} 1 & 2 \\ 2 & 1 \end{pmatrix} \begin{pmatrix} x_1(t) \\ x_2(t) \end{pmatrix}.$$

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Let's plug this into the ODE.

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In general, if there are two numbers λ_1 and λ_2 and two vectors $\boldsymbol{v}_1$ and $\boldsymbol{v}_2$ with:

$$M\boldsymbol{v}_1 = \lambda_1 \boldsymbol{v}_1$$
$$M\boldsymbol{v}_2 7 = \lambda_2 \boldsymbol{v}_2$$

and $\boldsymbol{v}_1 \neq c\boldsymbol{v}_2$, the general solution to the differential equation can be found by:

Chapter 7

Find the general solution to the ODE:

$$\begin{pmatrix} x_1(t) \\ x_2(t) \end{pmatrix}' = \begin{pmatrix} 1 & 1 \\ 4 & 1 \end{pmatrix} \begin{pmatrix} x_1(t) \\ x_2(t) \end{pmatrix}.$$

Given:

$$\begin{pmatrix} 1 & 1 \\ 4 & 1 \end{pmatrix} \begin{pmatrix} 1 \\ 2 \end{pmatrix} = 3 \begin{pmatrix} 1 \\ 2 \end{pmatrix}$$
$$\begin{pmatrix} 1 & 1 \\ 4 & 1 \end{pmatrix} \begin{pmatrix} 1 \\ -2 \end{pmatrix} = -1 \begin{pmatrix} 1 \\ -2 \end{pmatrix}.$$

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Find the general solution to the ODE:

$$\begin{pmatrix} x_1(t) \\ x_2(t) \end{pmatrix}' = \begin{pmatrix} -.5 & 1 \\ -1 & -.5 \end{pmatrix} \begin{pmatrix} x_1(t) \\ x_2(t) \end{pmatrix}.$$

Given:

$$\begin{pmatrix} -.5 & 1 \\ -1 & -.5 \end{pmatrix} \begin{pmatrix} 1 \\ i \end{pmatrix} = (-\frac{1}{2} + i) \begin{pmatrix} 1 \\ i \end{pmatrix}$$
$$\begin{pmatrix} -.5 & 1 \\ -1 & -.5 \end{pmatrix} \begin{pmatrix} 1 \\ -i \end{pmatrix} = (-\frac{1}{2} - i) \begin{pmatrix} 1 \\ -i \end{pmatrix}$$

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