Background Example

Find the general solution to the differential equation $\frac{dx}{dt} = k\,x$ and use that solution to help solve the system $\frac{d\vec{y}}{dt} = A\,\vec{y}$ given that $A = \begin{bmatrix} 2 & 0 \\ 0 & 3 \end{bmatrix}$ and $\vec{y}(0) = \begin{bmatrix} -4 \\ -2 \end{bmatrix}$.

Example 2

Solve the system $\begin{cases} y_1' = y_1 + 2y_2 \\ y_2' = -y_1 + 4y_2 \end{cases}$ given that $y_1(0) = -5$ and $y_2(0) = 0$. Begin by writing the system in the form $\vec{y}' = A\,\vec{y}$ and "decoupling" the system by diagonalizing A and making substitutions based upon $\vec{y} = P\,\vec{w}$ and $\vec{y}' = P\,\vec{w}'$.

Example 3

Solve the system $\begin{cases} y_1' = y_1 + 2y_2 \\ y_2' = 2y_1 + 4y_2 \end{cases}$ given that $y_1(0)=1$ and $y_2(0)=-1$. Begin by writing the system in the form $\vec{y}' = A\,\vec{y}$ and "decoupling" the system by diagonalizing A and making substitutions based upon $\vec{y} = P\,\vec{w}$ and $\vec{y}' = P\,\vec{w}'$.

Example 4

Solve the system $\begin{cases} y_1' &= y_2 \\ y_2' &= -y_1 \end{cases}$ given that $y_1(0)=3$ and $y_2(0)=3$. Begin by writing the system in the form $\vec{y}' = A\,\vec{y}$ and "decoupling" the system by diagonalizing A and making substitutions based upon $\vec{y} = P\,\vec{w}$ and $\vec{y}' = P\,\vec{w}'$.