Example 11.1

Solve the system $\frac{d\mathbf{y}}{dt} = A\,\mathbf{y}$ given that $A = \begin{bmatrix} 2 & 0 \\ 0 & 3 \end{bmatrix}$ and $\mathbf{y}(0) = \begin{bmatrix} -4 \\ -2 \end{bmatrix}$.

Example 11.2

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 $\mathbf{y}' = A\,\mathbf{y}$ and "uncoupling" the system by diagonalizing A and making substitutions based upon $\mathbf{y} = P\mathbf{w}$ and $\mathbf{y}' = P\mathbf{w}'$.

Example 11.3

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 $\mathbf{y}' = A\,\mathbf{y}$ and "uncoupling" the system by diagonalizing A and making substitutions based upon $\mathbf{y} = P\mathbf{w}$ and $\mathbf{y}' = P\mathbf{w}'$.

Example 11.4

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 $\mathbf{y}' = A\,\mathbf{y}$ and "uncoupling" the system by diagonalizing A and making substitutions based upon $\mathbf{y} = P\mathbf{w}$ and $\mathbf{y}' = P\mathbf{w}'$.