Homogeneous Linear Systems Part I

Distinct Real Eigenvalues

1. Find the general solution of the system.

$\frac{dx}{dt} = x + 2y$

$\frac{dy}{dt} = 4x + 3y$

2. Find the general solution of the system.

$\frac{dx}{dt} = -4x + 2y$

$\frac{dy}{dt} = -\frac{5}{2}x + 2y$

3. Find the general solution of the system.

$\frac{dx}{dt} = x + y - z$

$\frac{dy}{dt} = 2y$

$\frac{dz}{dt} = y - z$

4. Solve the initial-value problem.

$$\mathbf{X}' = \begin{pmatrix} \frac{1}{2} & 0 \\ 1 & -\frac{1}{2} \end{pmatrix} \mathbf{X}, \ \mathbf{X}(0) = \begin{pmatrix} 3 \\ 5 \end{pmatrix}$$

5. Find the general solution of the system.

$$\mathbf{X}' = \begin{pmatrix} -1 & 1 & 0 \\ 1 & 2 & 1 \\ 0 & 3 & -1 \end{pmatrix} \mathbf{X}$$