

## Part I Problems

In the next three problems, solve the given DE system  $x' = Ax$ . First find the eigenvalues and associated eigenvectors, and from these construct the normal modes and thus the general solution.

**Problem 1:** Solve  $x' = Ax$ , where  $A$  is  $\begin{bmatrix} -3 & 4 \\ -2 & 3 \end{bmatrix}$ .

**Problem 2:** Solve  $x' = Ax$  where  $A$  is  $\begin{bmatrix} 4 & -3 \\ 8 & -6 \end{bmatrix}$ .

**Problem 3:** Solve  $x' = Ax$  where  $A$  is  $\begin{bmatrix} 1 & -1 & 0 \\ 1 & 2 & 1 \\ -2 & 1 & -1 \end{bmatrix}$ .

**Problem 4:** Find the real solutions to the system  $x' = Ax = \begin{bmatrix} 3 & -4 \\ 4 & 3 \end{bmatrix} x$ .

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18.03SC Differential Equations  
Fall 2011

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