

**Homework #10**

Math 527, UNH spring 2013

Find the general solution of these systems of equations. If the system has complex eigenvalues, express the solution in terms of both a complex exponentials and sines and cosines. Boldface indicates a vector of appropriate dimension, e.g.

$$\mathbf{x} = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix}$$

**Problem 1:** Write the system in the form  $\mathbf{x}' = A\mathbf{x}$  and then find the general solution.

$$\begin{aligned} x_1' &= 4x_1 - 3x_2 \\ x_2' &= 2x_1 - 3x_2 \end{aligned}$$

**Problem 2:** Find the general solution.

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

**Problem 3:** Find the general solution.

$$\mathbf{x}' = \begin{pmatrix} 1 & -3 \\ 3 & 7 \end{pmatrix} \mathbf{x}$$

**Bonus:** Find the general solution.

$$\mathbf{x}' = \begin{pmatrix} 2 & 4 & 4 \\ -1 & -2 & 0 \\ -1 & 0 & -2 \end{pmatrix} \mathbf{x}$$