M427J: Differential Equations with Linear Algebra
Homework # 09
Handout: 04/04/2017, Tuesday
Due: 04/12/2017, Wednesday

• **Submission:** Please make your homework neat and **STAPLED**. You have to submit your homework **Wednesday** in the Problem Session. Note that *no late homework will be accepted.*

• **Assignments for Section 3.4: Eigenvalue Problems:**

In each of the following problem find all eigenvalues and eigenvectors of the given matrix.

1. $\begin{pmatrix} 5 & -1 \\ 3 & 1 \end{pmatrix}$ 2. $\begin{pmatrix} 3 & -2 \\ 4 & -1 \end{pmatrix}$ 3. $\begin{pmatrix} -2 & 1 \\ 1 & -2 \end{pmatrix}$

• **Assignments for Section 3.5: Homogenous Linear System with Constant Coefficients**

In each of the following problems find the general solution of the given system of equations.

1. $\mathbf{x}' = \begin{pmatrix} 1 & -2 \\ 3 & -4 \end{pmatrix} \mathbf{x}$ 2. $\mathbf{x}' = \begin{pmatrix} 2 & -1 \\ 3 & -2 \end{pmatrix} \mathbf{x}$ 3. $\mathbf{x}' = \begin{pmatrix} 1 & 1 \\ 4 & -2 \end{pmatrix} \mathbf{x}$

In each of the following problem solve the given initial value problem. Describe the behavior of the solution as $t \to \infty$.

$$4.\ \mathbf{x}' = \begin{pmatrix} 5 & -1 \\ 3 & 1 \end{pmatrix} \mathbf{x}, \qquad \mathbf{x}(0) = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$$

$$5.\ \mathbf{x}' = \begin{pmatrix} -2 & 1 \\ -5 & 4 \end{pmatrix} \mathbf{x}, \qquad \mathbf{x}(0) = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$$