Homework Assignment #17   Fall 2013 - MATH308

due Monday Nov. 25 at the beginning of class

Section covered: 7.5 (the case when there are repeated eigenvalues and a basis of eigenvectors)& 7.8 (when there are repeated eigenvalues but no basis of eigenvectors)

1. Find the general solution of the following system of linear differential equations:

$$\begin{cases} x_1' &= x_1 - 2x_2 + 2x_3 \\ x_2' &= -2x_1 + x_2 - 2x_3 \\ x_3' &= 2x_1 - 2x_2 + x_3 \end{cases}$$

   if it is known that $\begin{pmatrix} e^{5t} \\ -e^{5t} \\ e^{5t} \end{pmatrix}$ is a particular solution of this system.

2. Find the general solution of the following system of linear differential equations:

$$\begin{cases} x_1' &= -x_1 + 3x_2 \\ x_2' &= -3x_1 + 5x_2 \end{cases} \tag{1}$$

3. (**bonus 50 points**) Find the general solution of the following system of linear differential equations:

$$\begin{cases} x_1' &= -x_1 + x_2 + x_3 \\ x_2' &= -4x_1 - 6x_2 - 7x_3 \\ x_3' &= 3x_1 + 3x_2 + 4x_3 \end{cases}$$

   if it is known that the characteristic polynomial is equal to $-\lambda^3 - 3\lambda^2 + 4$.