M427J: Differential Equations with Linear Algebra
Homework # 10
Handout: 04/11/2017, Tuesday
Due: 04/19/2017, 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 3.6: Homogenous Linear System with Constant Coefficients (II)- Complex Eigenvalues

In each of the following problems express the general solution of the given system of equations in terms of real-valued functions.

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

• Assignments for Section 3.7: Homogenous Linear System with Constant Coefficients (III)- Repeated Eigenvalues

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

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

(Hint for Prob. 3: one of the eigenvalues is \( -1 \))

• Assignments for Section 5.1 (I): Two-Point Boundary Value Problems

In each of the following problems, either solve the given boundary value problem or else show that it has no solution.

1. \( y'' + 2y = 0, \quad y'(0) = 1, \quad y'(\pi) = 0 \)
2. \( y'' + y = 0, \quad y'(0) = 1, \quad y(L) = 0 \)
3. \( y'' + 2y = x, \quad y(0) = 0, \quad y(\pi) = 0 \)
4. \( y'' + 4y = \sin x, \quad y(0) = 0, \quad y(\pi) = 0 \)