Name: _____

Section/Time of lecture: _____

Professor/GSI: _____

MIDTERM II

Each part of a problem counts equally. To get full score you need to carefully explain what you did.

Problem	Points	Score
1	6	
2	6	
3	6	
4	7	
TOTAL	25	

Problem 1.

a) Find a particular solution of

$$y'' + 6y' + 9y = x^3$$

b)Find the general solution of

$$y'' + 6y' + 9y = e^{-3x}$$

c)

Use the method of variation of parameters to find a particular solution of

$$y'' - 4y' + 4y = e^{2x}$$

Problem 2.

a)

Write the equation

$$x'' - 11x' + 2x = t \ln t$$

as a system of first order equations.

b) Find the general solution of the system

$$\begin{aligned} x' &= 2y \\ y' &= -7x \end{aligned}$$

using the method of elimination.

c) Find the solution of

$$\begin{aligned} x' &= 2x - y, x(0) = 1 \\ y' &= 5x + y, y(0) = -1 \end{aligned}$$

using the method of elimination.

Problem 3. a)
The matrices

$$\begin{matrix} 1 & 2 \\ 4 & 3 \end{matrix}$$

$$\begin{matrix} 1 & 3 \\ 4 & 2 \end{matrix}$$

Calculate AB and find det(AB).
b) Find the eigenvalues of

$$\begin{matrix} 1 & 3 \\ 4 & 2 \end{matrix}$$

c) Find the eigenvectors of

$$\begin{matrix} 1 & 3 \\ 4 & 2 \end{matrix}$$

Problem 4.

a) Find the general solution of the system

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

using the eigenvalue method.

b) Find eigenvalues and eigenvectors of the matrix

$$\begin{matrix} 3 & -4 \\ 4 & 3 \end{matrix}$$

c) Find the general solution of the system

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