MATH 202 - Final - Term 133
Duration: 150 minutes

Name:_____   ID Number:_____

Section Number:_____   Serial Number:_____

Class Time: _____   Instructor's Name:_____

Instructions:

1. Calculators and Mobiles are not allowed.

2. Write neatly and legibly. You may lose points for messy work.

3. Show all your work. No points for answers without justification.

4. Make sure that you have a complete exam paper.

Question Number	Points	Maximum Points
1		6
2		6
3		9
4		9
5		6
6		9
7		9
8		6
Total		60

1. Solve the initial value problem

$$x\,dy + (y+1)\,dx = 0, \qquad y(1) = 2.$$

2. Solve the equation
$$y''' + 2y'' + y' + 2y = x.$$

3. Find a particular solution for the system

$$\mathbf{X}' = \mathbf{A}\mathbf{X} + \begin{pmatrix} 1 \\ 0 \end{pmatrix},$$

where $\mathbf{A}$ is a 2×2 constant matrix such that

$$e^{\mathbf{A}t} = \begin{pmatrix} 2 - e^{-t} & e^t - 1 \\ 2 - e^{-t} & 2e^{-t} - 1 \end{pmatrix}.$$

4. Solve the system

$$\mathbf{X}' = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 2 & -1 \\ 0 & 9 & 2 \end{pmatrix} \mathbf{X}.$$

5. The population of a town grows at a rate proportional to the population present at time t. If the population in the year 2011 was 4500 and in the year 2013 was 4800. what will be the population in 2015?

6. Solve the system

$$\mathbf{X}' = \begin{pmatrix} 2 & -1 \\ 1 & 0 \end{pmatrix} \mathbf{X}.$$

7. Let

$$\begin{pmatrix} e^t & t \\ e^{2t} & 0 \end{pmatrix}$$

be a fundamental matrix for the system

$$\mathbf{X}' = \mathbf{AX}.$$

Find the solution that satisfies the initial condition $\mathbf{X}(1) = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$.

8. Find the <u>first four terms</u> of a series solution of the equation

$$x^2 y'' - xy = 0$$

about the point $x = 0$.