MATH 202 - Major Exam II - Term 173
Duration: 90 minutes

Name:_____   ID Number:_____

Section Number:_____   Serial Number:_____

Class Time: _____   Instructor Name:_____

Instructions:

1. Calculators and Mobile Phones not allowed.

2. Please write legibly. No credit for answers without steps.

3. Make sure that you have nine pages of problems (Total of nine Problems).

Question Number	Points	Maximum Points
1		10
2		8
3		8
4		10
5		16
6		10
7		14
8		16
9		8
Total		100

1. (10 Points) Verify that $y_1 = x^2$ and $y_2 = 1/x^2$ form a fundamental set of solutions of $x^2\, y'' + x\, y' - 4\, y = 0$ for all values of x belonging to the interval $(0,\ \infty)$.

2. (8 Points) $y_{p_1} = x^4/15$ is a particular solution of $x^2\, y'' + 4\, x\, y' + 2\, y = 2\, x^4$, while $y_{p_2} = x^2/3$ is a particular solution of $x^2\, y'' + 4\, x\, y' + 2\, y = 4\, x^2$ on an interval $(0, \infty)$. Use superposition principle to find particular solution of $x^2\, y'' + 4\, x\, y' + 2\, y = 5\, x^4 - 3\, x^2$.

3. (8 Points) Without using the Wronskian, determine whether the set of functions $\{e^x,\ e^{-x},\ sinh\ x\}$ is linearly dependent or linearly independent?

4. (10 Points) $y_1 = x\ cos\ x$ is one solution of $x^2\ y'' - 2\ x\ y' + (x^2 + 2)y = 0$ with $x > 0$. Use REDUCTION of order method to find the second solution of this equation.

5. (16 Points) Solve the third order IVP given by:

$$y''' + 2\,y'' + y' + 2y = 0,$$

$$y(0) = 0,\ y'(0) = 0,\ \text{and}\ y''(0) = 1.$$

6. (10 Points) Find a linear differential operator which annihilates

$$f(x) = \tfrac{3}{2} + x \; - \; cos^2 x + x \; e^{5x} \; sin(4x).$$

7. (14 Points) Use the method of UNDETERMINED coefficients to find the particular solution of $y'' - y = x + e^x$.

8. (16 Points) Find the general solution of the Cauchy-Euler equation

$$2\,x^2 y'' + 3\,xy' - y = x$$

on the interval $(0, \infty)$.

9. (8 Points) Transform the differential equation

$$6\ x^2 y'' + 5\ xy' - y = 2$$

to a constant coefficient equation.
(NOTE:Do not solve the resulting equation)