King Fahd University of Petroleum & Minerals
Department of Mathematics & Statistics

MATH 202 - Exam II - Term 133

Duration: 90 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		7
2		7
3		5
4		7
5		7
6		7
Total		40

1. Solve the equation $y''' - y'' + 4y' - 4y = 0$.

2. Solve the equation $y'' - 4y = e^{2x}$ by undetermined coefficients.

3. Show whether or not the solutions

$$y_1 = x, \qquad y_2 = x^{-2}, \qquad y_3 = 3x^{-2} + 2x,$$

of the equation

$$x^3y''' + 6x^2y'' + 4xy' - 4y = 0$$

form a fundamental set on $(0, \infty)$.

4. Solve the equation

$$(x+1)^2\, y'' + (x+1)\, y' - y = 0.$$

Give the largest interval over which the solution is defined.

5. Find two power series solutions of the equation

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

about the ordinary point $x = 0$.

6. Find the indicial roots of the regular singularity $x = 0$ of the equation

$$xy'' + \frac{1}{2}y' + (1 - x^2)y = 0.$$

Without solving, discuss the number of series solutions you would expect to find using the method of Frobenius.