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

MATH 202 - Exam I - 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 eligibly. You may lose points for messy work.
3. Show all your work. No points for answers without justification.
4. Make sure that you have 5 pages of problems (Total of 8 Problems)

Question Number	**Points**	**Maximum Points**
1		4
2		6
3		4
4		4
5		4
6		6
7		6
8		6
Total		40

1. Find the value c such that
$$y(x) = \frac{c}{1+x^2}$$
is a solution of the differential equation $y' = 2xy^2$.

2. Find the general solution of the differential equation
$$xy' + 2y = x.$$
Give the largest interval over which the general solution is defined.

3. The two-parameter family

$$y = c_1 e^x \cos x + c_2 e^x \sin x$$

is a solution of the differential equation $y'' - 2y' + 2y = 0$. Determine whether a member of the family can be found that satisfies the boundary conditions

$$y(0) = 1, \qquad y(\pi) = 0.$$

4. Reduce the equation

$$y' = (y + 2x - 1)^3 + 1$$

to an equation with separable variables. **(Do not solve)**

5. Determine the regions of the xy-plane for which the differential equation

$$y' = \frac{\sqrt{9 - y^2}}{x}$$

would have a unique solution whose graph passes through a point (x_0, y_0) in these regions.

6. Solve the initial value problem

$$\sin x\, dx + 2y \cos x\, dy = 0, \quad y(0) = 1.$$

7. An object whose temperature is $90°C$ is placed in a refrigerator. One minute later its temperature is $70°C$. How long will it take for this object to cool off to the refrigerator temperature of $40°C$.

8. Show that

$$2ydx + (y + 2x)dy = 0$$

is an exact equation and solve it.