King Fahd University of Petroleum & Minerals

Math 202 - Sec. 1

Dr. Jawad Y. Abuihlail

Final Exam **Semester 061** **3 Hours**
Name: **ID #:** **Section #: 1**

REMARK: Show all details

Q1. (40 points, estimated time 80 minutes) Solve the following differential equations:

1. $\cos^2(x)\sin(x)dy + (\cos^3(x)y - 1)dx = 0$
2. $(x + ye^{y/x})dx - xe^{y/x}dy = 0$
3. $y''-2y'+y = e^x \tan^{-1}(x)$
4. $(x+2)^2y''+(x+2)y'+y = 0$

Q2. (15 points, estimated time 20 minutes) Solve the I.V.P.:

$$y''' - 2y'' + y' = xe^x + 5,\ y(0) = 2,\ y'(0) = 2,\ y''(0) = -1.$$

Q3. (15 points, estimated time 20 minutes) Provide a series solution (in powers of x) for the following differential equation:

$$2xy'' + 5y' + xy = 0.$$

Q4. (15 points, estimated time 20 minutes) The population of bacteria in a culture grows at rate proportional to the population present at time t. After 2 hours, it's observed that 300 bacteria are present. After 15 hours 5000 bacteria are present. What was the initial number of bacteria?

Q5. (15 points, estimated time 20 minutes) Solve the following system of differential equations:

$$\begin{aligned} \frac{dx}{dt} &= x + z \\ \frac{dy}{dt} &= y \\ \frac{dz}{dt} &= x + z \end{aligned}$$

GOOD LUCK