King Fahd University of Petroleum & Minerals

Math 202 - Sec. 1

Dr. Jawad Y. Abuihlail

First Major Exam **Semester 061** **90 Minutes**
Name: **ID #:** **Section #:**

Q1. (15 points) Show that the following IVP has a unique solution and find it:

$$(x+1)\frac{dy}{dx} + y = \ln x,\ y(1) = 10.$$

Q2. (20 points) Show that $\mu(x,y) = (x+y)^{-2}$ is an integrating factor for the ODE

$$(x^2 + 2xy - y^2)dx + (y^2 + 2xy - x^2)dy = 0$$

and use it to solve the equation.

Q3. (50 points) Solve each of the following ODEs.

1. $x^2\frac{dy}{dx} - 2xy = 3y^4$
2. $\frac{dy}{dx} = \frac{1-x-y}{x+y}$
3. $(y^3 + 10xy^4 - 2x)dx + (3xy^2 + 20x^2y^3)dy = 0.$

Q4, (15 points) A thermometer is removed from a room where the temperature is $70°F$ and is taken outside, where the air temperature is $10°F$. After one-half minute, the thermometer reads $50°F$.

1. What is the reading of the thermometer at $t = 1$ minute?
2. How long will it take the thermometer to reach $15°F$?