NDU

MAT 235

Ordinary Differential Equations

Exam # 1

Duration: 60 minutes

Name: _____

Section: A

Instructor: Dr. Ishac Zoghbi

Grade: _____

1) **(10 points)** Solve $\frac{dy}{dx} = \left(x^2 + y\right)^2 - 2x$. (***Hint:*** Let $v = x^2 + y$)

2) **(20 points)** Solve the differential equation $\frac{dy}{dx} + 4xy = \frac{x}{y^2}$.

3) **(20 points)** Find a continuous function satisfying the initial-value problem

$$\frac{dy}{dx} + y = \begin{cases} e^{-x}, & 0 \le x < 2 \\ e^{-2}, & x \ge 2 \end{cases} \quad ; \quad \text{with } y(0) = 1.$$

4) **(20 points)** Find the orthogonal trajectories of the family of circles $x^2 + (y - c)^2 = c^2$ where c is an arbitrary constant.

5) **(10 points)** Given the following Clairaut's differential equation $y = xy' - y'^2 - y'$.

a) Find a general solution.

b) Find a singular solution

6) **(20 points)** Solve the following differential equation by first finding an integrating factor. $\left(2x^2 + 3xy + y^2\right)dx + \left(x^2 + xy\right)dy = 0$.