Concordia University February 13, 2009

Applied Ordinary Differential Equations
ENGR 213 - Section J
Prof. Alina Stancu

Exam I (A)

Directions: You have **60 minutes** to solve the following **4** problems. You may use an admissible calculator. No cell phones are allowed during the exam.

(1) (10 points) Find a general solution of the differential equation

$$\frac{dy}{dx} = 4(y^2 + 1).$$

You may leave the solution in implicit form.

(2) (10 points) Solve the following Bernoulli equation by the appropriate substitution

$$\frac{dy}{dx} + y = xy^4.$$

You may leave the solution in implicit form.

(3) (10 points) Solve the exact initial value problem

$$\frac{x}{2y^4}\,dx + \left(\frac{3y^2 - x^2}{y^5} + \sqrt{2y}\right)\,dy = 0, \quad y(0) = 2,$$

leaving the solution in implicit form.

(4) (10 points) A large tank is filled to capacity with 100 gallons of pure water. Brine containing 3 pounds of salt per gallon is pumped into the tank at a rate of 4 gal/min. The well-mixed solution is pumped out of the tank at the rate of 5 gal/min.

Find the number of pounds of salt in the tank after 30 minutes.