

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

**Exam I (B)**

**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

$$x^2 \frac{dy}{dx} = y(1 - x).$$

You may leave the solution in implicit form.

- (2) (10 points) Solve the given homogeneous equation by the appropriate substitution

$$y dx - (x + y) dy = 0.$$

You may leave the solution in implicit form.

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

$$y(y + \sin x) dx + \left( 2xy - \cos x + \frac{1}{\sqrt{y+3}} \right) dy = 0, \quad y(0) = 1,$$

leaving the solution in implicit form.

- (4) A large tank is partially filled with 150 gallons of pure water. Brine containing 2 pounds of salt per gallon is pumped into the tank at a rate of 5 gal/min. The well-mixed solution is pumped out of the tank at the rate of 4 gal/min.

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