Read each problem **very carefully** before starting to solve it. Each problem is worth 5 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. A tank with capacity 200 gal is full with water with 100 lb of salt in solution. Water containing 1 lb of salt per gallon is entering at the rate of 4 gal/min and the mixture is allowed to flow out of the tank at the same rate. Find an equation for the amount of salt $y(t)$ in the tank at time t.

2. Consider the first-order differential equation

$$2xy - 9x^2 + (2y + x^2 + 1)\frac{dy}{dx} = 0, \quad y(0) = -3.$$

(a) Check whether the differential equation is exact.

(b) If it is, then use the relevant method to find a general solution and a particular solution for the given initial value problem.