2.4 Exact Equations

1. Determine whether the equation is exact. If it is, then solve it.

$$(2xy + 3)dx + (x^2 - 1)dy = 0$$

2. Solve the initial value problem

$$(e^t x + 1)dt + (e^t - 1)dx = 0, \quad x(1) = 1$$

3.2 Compartmental Analysis

1. A brine solution of salt flows at a constant rate of 4 L/min into a large tank that initially held 100 L of pure water. The solution inside the tank is kept well stirred and flows out of the tank at a rate of 3 L/min. If the concentration of salt in the brine entering the tank is 0.2 kg/L, determine the mass of salt in the tank after t min. When will the concentration of the salt in the tank reach 0.1kg/L?

3.4 Newtonian Mechanics

1. An object of mass 8 kg is given an upward initial velocity of 20 m/sec and then allowed to fall under influence of gravity. Assume that the force in newtons due to air resistance is $-16v$, where v is the velocity of the object in m/sec. Determine the equation of motion of the object. If the object is initially 100 m above the ground, determine when the object will strike the ground.