## 2.3 Linear Equation

1. Solve the equation 
$$x\frac{dy}{dx} + 3(y+x^2) = \frac{1}{x}$$

2. Solve the initial value problem  $\sin x \frac{dy}{dx} + y \cos x = x \sin x, \qquad y(\frac{\pi}{2}) = 2$ 

## 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 0.1 kg/L?