Math 217-001 201810
Practice Assignment # 4

1. Solve each equation in two ways: as exact, and by an appropriate substitution.

   (a) $x + y + x\,y' = 0$

   (b) $x - y + x\,y' = 0$

2. Solve the IVP.

   (a) $y' = (x + 3y)/(3x + y)$, $y(0) = 2$

   (b) $x^2 + 2y^2 = xy\,y'$, $y(-1) = 1$

   (c) $x\,y' - (1 + x)y = xy^2$, $y(1) = 1$

   (d) $y' = \dfrac{1 - x - y}{x + y}$, $y(0) = 1$

3. When a vertical beam of light passes through a transparent medium, the rate at which its intensity I decreases is proportional to $I(t)$, where t represents the thickness of the medium (in metres). In clear seawater, the intensity 1 metre below the surface is 25% of the initial intensity I_0 of the incident beam. What is the intensity of the beam 3 metres below the surface?

4. The number $N(t)$ of people in a community who are exposed to a particular advertisement is governed by the logistic equation. Initially, $N(0) = 500$, and it is observed that $N(1) = 1000$. Solve for $N(t)$ if it is predicted that the limiting number of people in the community who will see the advertisement is $50,000$.

5. A model for the population $P(t)$ in a suburb of a large city is given by the initial-value problem

   $$P' = P(10^{-1} - 10^{-7}P), \quad P(0) = 5000,$$

   where t is measured in months. What is the limiting value of the population? At what time will the population be equal to one-half of this limiting value?