1. Determine all equilibrium solutions for the differential equation

$$y' = y(10 - y)$$

   If this differential equation describes the size, $y(t)$, of a population at time t, what would happen to the population over time if the initial population was $y(0) = 3$? Explain. *(6 points)*

2. Find the general solution to the given differential equation. Explain what happens to the solutions as t gets large. Then find the particular solution with the property $y(0) = 1$. *(7 points)*

$$\frac{dy}{dt} = -2ty - 4t$$

3. A tank contains 1000 gallons of contaminated water in which 100 pounds of pollutant is dissolved. Contaminated water containing 2 pounds of pollutant per gallon runs into the tank at a rate of 5 gallons per minute. Contaminated water leaves the tank at the same rate. Assume the solution in the tank is always thoroughly mixed. Write the initial value problem the solution to which would give the amount of pollutant in the tank at time t. YOU DO NOT NEED TO FIND THE SOLUTION. *(7 points)*