Modelling with 1st Order Equations (2.3)

1. A tank originally contains 40 gal of water with 5 lb of salt in solution. Water containing \( \frac{1}{10} \) lb of salt per gallon is entering at a rate of 2 gal/min, and the well-stirred solution in the tank is leaving at the same rate.

   a. Write down the differential equation for \( Q(t) \), the amount of salt in the tank.

   b. Write the initial value problem for \( Q(t) \).

   c. Find \( Q(t) \) by solving the initial value problem.
2. The population of mosquitoes in a certain area increases at a rate proportional to the current population, and in the absence of other factors, the population doubles each week. There are 800,000 mosquitoes in the area initially, and the predators eat 30,000 mosquitoes/day. Determine the population of mosquitoes in the area at any time.