**Question 1**

Suppose that a 100L tank of water contains 8800g of a Chlorine salt dissolved in the water. The tank is being continuously drained at a continuous rate of 12.5L per day, and being refilled by the same amount of solution. The solution filling the tank has concentration $25 + 10\sin(2\pi t)$ g/L, where $t$ is measured in days. Assume that there is perfect mixing in the solution.

1. (3) Write a differential equation that describes the amount of salt in the tank over time.

$$\frac{dy}{dt} = -\frac{12.5}{100}y + \big(25 + 10\sin(2\pi t)\big)12.5$$

2. (4) Solve the differential equation with appropriate initial conditions to find the amount salt in the tank at an arbitrary time, $t$.

$$S(t) = e^{\int_{w=0}^{w=t} A(w)\,dw} = e^{-0.125t} = e^{-t/8}$$