1. Solve the initial value problem \( y' = y^2 \sin x \), \( y(0) = -1 \).

\[
\int \frac{dy}{y^2} = \int \sin x \, dx \quad \Rightarrow \quad -\frac{1}{y} = -\cos x + C \quad \Rightarrow \quad y = \frac{1}{\cos x + C}
\]

\[-1 = \frac{1}{1+C} \quad \Rightarrow \quad 1+C = -1 \quad C = -2
\]

\[y(x) = \frac{1}{\cos x - 2}\]

2. A tank contains 3,000 L of brine with 15 kg of dissolved salt. Pure water enters the tank at a rate of 50 L/min. The solution is kept thoroughly mixed and drains from the tank at the same rate. How much salt is in the tank after 20 minutes?

\[y(0) = 15 \quad \frac{dy}{dt} = 0 - \frac{y}{3000} \cdot 50 \quad = -\frac{y}{60}
\]

\[
\int \frac{dy}{y} = \int -\frac{1}{60} \, dt \quad \Rightarrow \quad \ln y = -\frac{1}{60} t + C \quad \Rightarrow \quad y = ke^{-\frac{t}{60}}
\]

\[k = 15 \quad y(20) = 15e^{-\frac{20}{60}} = 10.75 \text{ kg}\]