Q1. Find a suitable substitution that transforms the differential equation

\[
\frac{dy}{dx} = (3y + 9x)^2 - 3
\]

in to a separable differential equation. Hence, solve the above differential equation for the initial value problem with \( y(0) = 1/3 \).

Q2. Solve the initial value problem

\[
\left( \ln\left( \frac{y}{x} \right) + \exp(2y) \right) dx + \left( \frac{1}{2y} + \frac{2x}{3} \exp(2y) \right) dy = 0,
\]

\( y(1) = 1 \).

(Leave the solution in *implicit* form.)

Q3. A glass of water initially at 112°C is placed in a fridge. The fridge is kept at the constant temperature of 2°C. After one hour the temperature of the water in the glass is 30°C. Find the exact time needed for the temperature of the water to reach 10°C after it is placed in the freezer.