Q1. The nonlinear DE $xy \, dx + (2x^2 + 3y^2 - \alpha) \, dy$ is not exact. Find an integrating factor (if possible) to make it an exact differential equation. Find a family $\phi(x, y) = c$ of solutions of the equation.

Q2. Use an appropriate substitution to solve $\frac{dy}{dx} + y = x^2 \cdot y^2$. 
Q3. When green tea cup is removed from the oven its temperature was 300°F. Three minutes later its temperature became 200°F. How long it will take for the tea to cool off to a room temperature of 70°F?