1. Use the method of Riccati equation and given particular solution, solve the following Riccati equation.

(a) $y' = 1 + t^2 - 2ty + y^2; \quad y_1(t) = t$

(b) $y' = \dfrac{2\cos^2 t - \sin^2 t + y^2}{2\cos t}; \quad y_1(t) = \sin t$

2. Use the idea of Bernoulli equation to solve the following DE or IVP.

(a) $x\dfrac{dy}{dx} + y = x^2 y^2$

(b) $x^2 \dfrac{dy}{dx} - 2xy = 3y^4, \quad y(1) = \dfrac{1}{2}$