7. (a) Show that the substitution $z = y^{-2}$ transforms the differential equation

$$x\frac{dy}{dx} + y + 4x^2y^3 \ln x = 0 \qquad x > 0 \qquad \text{(I)}$$

into the differential equation

$$\frac{dz}{dx} - \frac{2z}{x} = 8x \ln x \qquad x > 0 \qquad \text{(II)}$$

(5)

(b) By solving differential equation (II), determine the general solution of differential equation (I), giving your answer in the form $y^2 = f(x)$

(6)

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Question 7 continued

(Total for Question 7 is 11 marks)