3. (a) Show that the transformation $u = y^{-4}$ transforms the differential equation

$$4\frac{dy}{dx} = y - 2xy^5 \qquad \text{(I)}$$

into the differential equation

$$\frac{du}{dx} + u = 2x \qquad \text{(II)}$$

(3)

(b) Solve differential equation (II) to determine a general solution for u in terms of x.

(5)

(c) Hence determine the particular solution of differential equation (I) for which $y = 1$ at $x = 0$, giving your answer in the form $y^4 = f(x)$

(2)

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Question 3 continued

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Question 3 continued

(Total for Question 3 is 10 marks)