4.

$$\frac{d^2y}{dx^2} = x^2y + \frac{dy}{dx}$$

(a) Show that

$$\frac{d^4y}{dx^4} = \frac{d^3y}{dx^3} + Ax^2\frac{d^2y}{dx^2} + Bx\frac{dy}{dx} + Cy$$

where A, B and C are integers to be determined.

(4)

Given that $\frac{dy}{dx} = 3$ and $y = 1$ at $x = 1$

(b) determine the Taylor series solution for y in ascending powers of $(x - 1)$, up to and including the term in $(x - 1)^4$, giving each coefficient in simplest form.

(4)

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Question 4 continued

(Total for Question 4 is 8 marks)