5. Given that

$$y\frac{d^2y}{dx^2} + 2\left(\frac{dy}{dx}\right)^2 - 2y = 0 \qquad y > 0$$

(a) determine $\frac{d^3y}{dx^3}$ in terms of $\frac{d^2y}{dx^2}$, $\frac{dy}{dx}$ and y

(4)

Given that $y = 2$ and $\frac{dy}{dx} = 1$ at $x = 0$

(b) determine a series solution for y in ascending powers of x, up to and including the term in x^3, giving each coefficient in its simplest form.

(4)

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Question 5 continued

(Total for Question 5 is 8 marks)