2. (i) $$f(x) = (1 + 4x)^2 \ln(1 + 4x) \qquad x > -\frac{1}{4}$$

(a) Show that

$$f''(x) = A\ln(1 + 4x) + B$$

where A and B are constants to be determined.

(3)

(b) Hence write down the coefficient of the term in x^2 in the Maclaurin series expansion of $f(x)$.

(1)

(ii) $$\frac{d^2y}{dx^2} + (3x - 1)\frac{dy}{dx} + 2y^2 = 5$$

Given that $y = 2$ and $\frac{dy}{dx} = -3$ at $x = 1$, determine the Taylor series expansion for y in ascending powers of $(x - 1)$, up to and including the term in $(x - 1)^3$, giving each coefficient in simplest form.

(6)

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Question 2 continued

(Total for Question 2 is 10 marks)