3. Given that

$$y = (1 - 2x)^2 \ln(1 - 2x) \qquad x < \frac{1}{2}$$

(a) show that

$$\frac{d^3y}{dx^3} = \frac{a}{1 - 2x}$$

where a is an integer to be determined.

(5)

(b) Hence determine the Maclaurin series expansion for y in ascending powers of x, up to and including the term in x^4, giving each coefficient in simplest form.

(5)

(Total for Question 3 is 10 marks)

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4. (a) Determine the general solution of the differential equation

$$4\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + y = 2e^{\frac{1}{2}x}$$

(7)

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

(b) determine the particular solution of the differential equation.

(4)

(Total for Question 4 is 11 marks)