Question Number	Scheme	Marks
3(a)	$y=(1-2x)^2\ln(1-2x)$ $\Rightarrow \frac{dy}{dx}=-4(1-2x)\ln(1-2x)+(1-2x)^2\left(\frac{-2}{1-2x}\right)$ $=-2(1-2x)(2\ln(1-2x)+1)$ o.e.	M1A1
	$\Rightarrow \frac{d^2y}{dx^2}=4(2\ln(1-2x)+1)-2(1-2x)\left(\frac{-4}{1-2x}\right)$ oe $\{=8\ln(1-2x)+12\}$	**d**M1 A1
	$\frac{d^3y}{dx^3}=\frac{-16}{1-2x}$	A1
		(5)
(b)	$\frac{d^4y}{dx^4}=16(1-2x)^{-2}\times -2=-32(1-2x)^{-2}$	M1 A1ft
	$y_0=0 \quad y_0'=-2 \quad y_0''=12 \quad y_0'''=-16 \quad y_0^{(4)}=-32$	M1
	$y=y_0+y_0'x+y_0''\frac{x^2}{2!}+y_0'''\frac{x^3}{3!}+y_0^{(4)}\frac{x^4}{4!}\ldots$ $\Rightarrow y=-2x+12\frac{x^2}{2!}-16\frac{x^3}{3!}-32\frac{x^4}{4!}\ldots$	M1
	$y=-2x+6x^2-\frac{8}{3}x^3-\frac{4}{3}x^4\ldots$	A1
		(5)
		Total 10

Notes

(a)

M1: Differentiates using product rule, allowing for sign/coefficient errors only

A1: Fully correct first derivative in any equivalent form. Award when first seen correct and ISW if they simplify incorrectly.

dM1: Dependent on the previous M mark. Uses product rule again to obtain an expression for the 2nd derivative, allowing for sign/coefficient errors only

A1: Fully correct expression in any form. Award when first seen correct and ISW if they simplify incorrectly.

A1: Fully correct expression for the third derivative, which must come from correct work

(b)

M1: Correct form for the 4th derivative $\frac{\mathrm{d}^4 y}{\mathrm{d}x^4} = \alpha(1-2x)^{-2}$

A1ft: Follow through their 3rd derivative. ISW if they then simplify a correct expression Incorrectly- award when first seen.

M1: Attempt at calculating values for y and their 1st, 2nd 3rd **and** 4th derivatives at $x = 0$
No need to check all values are correct for their derivatives, but award if the intention to evaluate all at $x = 0$ is clear and values are actually found for each.

M1: Correct method for finding the Maclaurin expansion **with all five** of their values (condone the missing 0 at the start). May have to check that their series follows from their values if formula not quoted. Series must be correct for their values but allow slips if a correct formula is quoted.

A1: Correct series obtained. Allow = or ≈ etc but must be $y = \ldots$
Allow $\mathrm{f}(x) = \cdots$ etc if $\mathrm{y} = \mathrm{f}(x)$ has already been defined.