Question Number	Scheme	Notes	Marks
2	$\frac{\mathrm{d}^2y}{\mathrm{d}x^2}-4\frac{\mathrm{d}y}{\mathrm{d}x}-5y^2=\mathrm{e}^{x^2-9}$		
	$\frac{\mathrm{d}^3y}{\mathrm{d}x^3}-4\frac{\mathrm{d}^2y}{\mathrm{d}x^2}-10y\frac{\mathrm{d}y}{\mathrm{d}x}=2x\mathrm{e}^{x^2-9}$	M1: Differentiates to obtain three correct terms A1: Fully correct differentiated equation	M1 A1
	$y(3)=2,\ y'(3)=-1$ $y''(3)-4(-1)-5\times2^2=1\Rightarrow y''(3)=17$ $y'''(3)-4(17)-10(2)(-1)=6\Rightarrow y'''(3)=54$	Uses the given equation and their equation to obtain values for $y''(3)$ and $y'''(3)$	M1
	$(y=)y(3)+y'(3)(x-3)+\frac{y''(3)}{2}(x-3)^2+\frac{y'''(3)}{3!}(x-3)^3\Rightarrow$ $2-1(x-3)+\frac{"17"}{2}(x-3)^2+\frac{"54"}{3!}(x-3)^3$	A correct unsimplified Taylor series for their $y''(3)$ and $y'''(3)$	M1
	$(y=)2-(x-3)+\frac{17}{2}(x-3)^2+9(x-3)^3$	Correct simplified series. "y = ..." is not required	A1
			(5)
			Total 5

Additional Notes

M1: Attempts to differentiate using the chain rule at least once – at least three terms correct, allowing for slips in rearranging before differentiation.

A1: Any correct third derivative expression. They may have rearranged first.

M1: Finds the values of the second and third derivatives using the given equation and their third derivative expression (which must have at least three terms). Condone one slip in substitutions as long as evidence of the correct values used is seen. If substitution is not seen, correct values can imply the method.

M1: Applies the Taylor Series formula correctly with the given values of y and $\frac{\mathrm{d}y}{\mathrm{d}x}$ and with their values for the second and third derivatives – the first two terms must be correct. If the values of their second and third derivatives are not explicitly stated but embedded in the series, it must be clear that a correct attempt at the series has been used – the denominators 2 and 3! (or 6) must be seen – but their values need not be correct. Condone a miscopy of one of **their** values if it is clearly a correct attempt to apply their value to the series.

A1: Correct fully simplified series expansion. The y = is not required and condone if f(x) is used.