Question Number	Scheme	Marks
2 (i)	$y = x^2 \ln 2x \Rightarrow \left(\dfrac{\mathrm{d}y}{\mathrm{d}x} =\right) 2x\ln 2x + x$ o.e.	M1 A1
(ii)	$\left(\mathrm{f}'(x) =\right) \dfrac{2(4x+3)^2\mathrm{e}^{2x} - 8(4x+3)\mathrm{e}^{2x}}{(4x+3)^4}$ or $2\mathrm{e}^{2x}(4x+3)^{-2} - 8\mathrm{e}^{2x}(4x+3)^{-3}$	M1 A1
	$= \dfrac{\cancel{(4x+3)}\mathrm{e}^{2x}[2(4x+3)-8]}{(4x+3)^{\cancel{3}}}$ or $\mathrm{e}^{2x}(4x+3)^{-3}[2(4x+3)-8]$	dM1
	$= \dfrac{2\mathrm{e}^{2x}(4x-1)}{(4x+3)^3}$	A1
		(6 marks)

(i)

M1 Attempts the product rule to achieve $Ax\ln 2x + Bx$ o.e. with $A, B \neq 0$ which may be unsimplified.

A1 $\left(\dfrac{\mathrm{d}y}{\mathrm{d}x} =\right) 2x\ln 2x + x$. Condone $\ln 2x(2x) + x$. isw after a correct answer.

(ii)

M1 Attempts the quotient rule to achieve $\dfrac{P(4x+3)^2\mathrm{e}^{2x} - Q(4x+3)\mathrm{e}^{2x}}{(4x+3)^4}$ with $P, Q > 0$. Allow $-Q(4x+3)\mathrm{e}^{2x}$ to be expanded, i.e. if correct $-(32x+24)\mathrm{e}^{2x}$ or $-32x\mathrm{e}^{2x} - 24\mathrm{e}^{2x}$.

Alternatively, attempts the product rule. Look for $P\mathrm{e}^{2x}(4x+3)^{-2} - Q\mathrm{e}^{2x}(4x+3)^{-3}$ with $P, Q > 0$.

In either case, Q may be written as the product of two integers.

Condone miscopying slips on $(4x+3)$, e.g. $(3x+4)$

A1 Using quotient rule: $\left(\mathrm{f}'(x) =\right) \dfrac{2(4x+3)^2\mathrm{e}^{2x} - 8(4x+3)\mathrm{e}^{2x}}{(4x+3)^4}$ o.e.

Using product rule: $\left(\mathrm{f}'(x) =\right) 2\mathrm{e}^{2x}(4x+3)^{-2} - 8\mathrm{e}^{2x}(4x+3)^{-3}$ o.e.

In either case, allow 8 to be written as (2)(4).

dM1 Dependent on previous M1. Correctly takes out a common factor of $(4x+3)\mathrm{e}^{2x}$ from their numerator and cancels $(4x+3)$. If using product rule, must take out a common factor of $(4x+3)^{-3}\mathrm{e}^{2x}$. They may also take out a factor of 2 at this stage, but this is not required for dM1.

A1 Achieves $\dfrac{2\mathrm{e}^{2x}(4x-1)}{(4x+3)^3}$. Do not allow $2\mathrm{e}^{2x}(4x-1)(4x+3)^{-3}$. Allow recovery of invisible brackets at any stage.

Question Number	Scheme	Marks
3 (i)	$\int 2(3x+5)^7\,\mathrm{d}x = \frac{(3x+5)^8}{12}(+c)$	M1 A1 **(2)**
(ii) (a)	By division $x^2+x-2\overline{)4x^3+x^2-7x+14}$ $\quad 4x-3$	M1 A1
	Remainder $= 4x+8$	M1
	$\frac{4x+8}{x^2+x-2} = \frac{4\cancel{(x+2)}}{\cancel{(x+2)}(x-1)}$	
	$\frac{4x^3+x^2-7x+14}{(x-1)(x+2)} \equiv 4x-3+\frac{4}{x-1}$	A1 **(4)**
(b)	$\int_3^9 \mathrm{f}(x)\,\mathrm{d}x = \left[2x^2-3x+4\ln(x-1)\right]_3^9$	M1 A1ft
	$= 126+4\ln 8-4\ln 2 = 126+8\ln 2$	dM1 A1 **(4)**
		(10 marks)

(i)

M1 Integrates and achieves $k(3x+5)^8$ where k is a constant. Any attempt that involves expanding $(3x+5)^7$ is unlikely to reach an answer in its simplest form, so probably scores M0A0, but if you think there is a meaningful attempt to factorise the answer into the required form, send to review. If a substitution is used, they must revert to x and reach $k(3x+5)^8$

A1 $\frac{(3x+5)^8}{12}$ with or without + c

(ii) (a)

By division

M1 Divides the cubic by x^2+x-2 and achieves a linear quotient $4x\pm...$. Watch out for different ways to present the division, e.g. grid method. They may divide first by $(x+2)$ and then by $(x-1)$ or vice versa. See exemplification below. Do not allow misreads for the quadratic divisor; or if dividing by the two linear factors separately, these must be correct.

A1 Achieves the linear quotient $4x-3$. This mark can be given even if slips in the division lead to an incorrect remainder.

M1 See one of the following 3 cases below for award of this mark. All 3 cases depend on a valid attempt at division and $Q(x)$ is their linear quotient after division.