Question			Answer	Marks	AO	Guidance
9			The graphs cross where $x = 5xe^{2x}$ $x(5e^{2x} - 1) = 0$	M1	3.1a	• Attempt to find crossing points of graphs by equating and attempt to solve i.e. getting as far as $x = \cdots$ or $x = 0$ • Condone cancelling x • Implied by correct exact value e.g. $\frac{1}{2}\ln\frac{1}{5}$ or $\ln\frac{1}{\sqrt{5}}$
			$x = 0$ and $x = \frac{1}{2}\ln\frac{1}{5}$ oe	A1	1.1	• Second value must be exact e.g. $x = -\frac{1}{2}\ln 5$ or $0.5\ln 0.2$ oe • isw conversion to decimal $(-0.804718\ldots)$ after correct values seen • $x = 0$ may be implied by use of 0 in limits, but must be seen at some point
			Area between $y = x$ and x-axis $= \frac{1}{8}(\ln 5)^2$	B1FT	2.2a	• FT *their* exact limit – may be done as part of integral i.e. $\frac{1}{2}(their\ \text{limit})^2$ • oe allow e.g. $-\frac{1}{8}(\ln 5)^2$ or $\frac{\left(-\frac{1}{2}\ln 5\right)^2}{2}$ or $\frac{1}{8}\left(\ln\frac{1}{5}\right)^2$ or $\frac{1}{2}\left(\ln\frac{1}{\sqrt{5}}\right)^2$ • isw use of incorrect log laws after correct value seen e.g. $2 \times \frac{1}{8}\ln 5$ or $\frac{1}{8}\ln 5^2$. • Allow recovery of poor notation (even if lost again later) – may not be seen until final answer

Question	Answer	Marks	AO	Guidance
	$\int_{-0.5\ln 5}^{0} (5xe^{2x})\,dx$	M1*	1.1a	• Integration by parts to reach $axe^{2x} - b\int e^{2x}dx$ (with $a \neq 0$, $b \neq 0$) • Ignore limits at this stage
	$= \left[\frac{5x}{2}e^{2x}\right]_{-0.5\ln 5}^{0} - \int_{-0.5\ln 5}^{0}\left(\frac{5}{2}e^{2x}\right)dx$	A1	2.1	• Ignore term (*) from integrating $y = x$ – marks are for integration by parts • E.g. $\int (x - 5xe^{2x})\,dx = \left[* - \frac{5x}{2}e^{2x}\right] + \int\left(\frac{5}{2}e^{2x}\right)dx$ OR $\int (5xe^{2x} - x)\,dx = \left[\frac{5x}{2}e^{2x} - *\right] - \int\left(\frac{5}{2}e^{2x}\right)dx$
	$\left[\frac{5x}{2}e^{2x} - \frac{5}{4}e^{2x}\right]_{-0.5\ln 5}^{0}$	A1	1.1	• Correct completion of integral • Implies previous M1 A1 • Ignore limits at this stage • Ignore term (*) from integrating $y = x$ e.g. $\left[* - \frac{5x}{2}e^{2x} + \frac{5}{4}e^{2x}\right]$ • Condone poor notation if intention is clear
	$\left(0 - \frac{5}{4}e^{0}\right) - \left(\frac{5(-0.5\ln 5)}{2}e^{2(-0.5\ln 5)} - \frac{5}{4}e^{2(-0.5\ln 5)}\right)$	M1dep*	2.1	• Substitutes *their* limits (either way round) into *their* integral - *their* limits must be exact • Implied by e.g. $-\frac{5}{4} + \frac{5\ln 5}{5\times 4} + \frac{5}{4\times 5}$ or $1 - \frac{1}{4}\ln 5$ or $-1 + \frac{1}{4}\ln 5$ provided *their* integral is correct

Question			Answer	Marks	AO	Guidance
			Shaded area is $1-\frac{1}{4}\ln 5-\frac{1}{8}(\ln 5)^2$ nfww	**A1** **[8]**	**1.1**	• cao, must be positive and exact. • Mark **final** answer • Allow $a=1, b=-\frac{1}{4}, c=-\frac{1}{8}$ if full expression not seen • Ignore units. • A0 for incorrect log laws e.g. writing $\frac{1}{8}(\ln 5)^2$ as e.g. $\frac{1}{8}\ln 5^2$ or $\frac{1}{8}\ln(5)^2$ or $-\frac{1}{4}\ln 5$