1. Fig. 8 shows the curve $y = f(x)$, where $f(x) = (1 - x)e^{2x}$, with its turning point P.

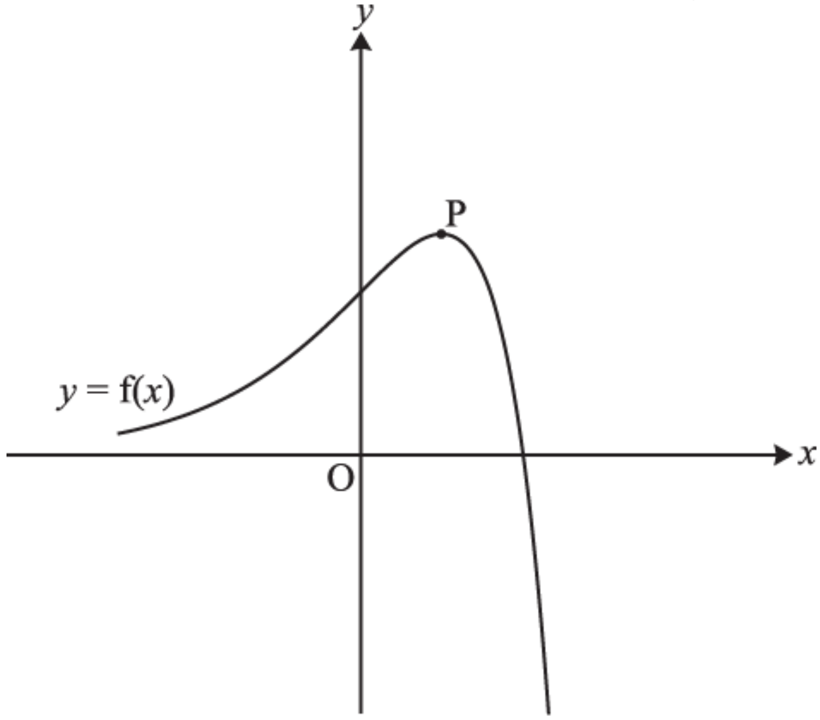


Fig. 8

i. Write down the coordinates of the intercepts of $y = f(x)$ with the x- and y-axes.

[2]

ii. Find the exact coordinates of the turning point P.

[6]

iii. Show that the exact area of the region enclosed by the curve and the x- and y-axes is $\frac{1}{4}\left(e^2 - 3\right)$.

[5]

The function $g(x)$ is defined by $g(x) = 3f\left(\frac{1}{2}x\right)$.

iv. Express $g(x)$ in terms of x.
Sketch the curve $y = g(x)$ on the copy of Fig. 8, indicating the coordinates of its intercepts with the x- and y-axes and of its turning point.

[4]

v. Write down the exact area of the region enclosed by the curve $y = g(x)$ and the x- and y-axes.

[1]

2. Fig. 9 shows the curve $y = xe^{-2x}$ together with the straight line $y = mx$, where m is a constant, with $0 < m < 1$. The curve and the line meet at O and P. The dashed line is the tangent at P.

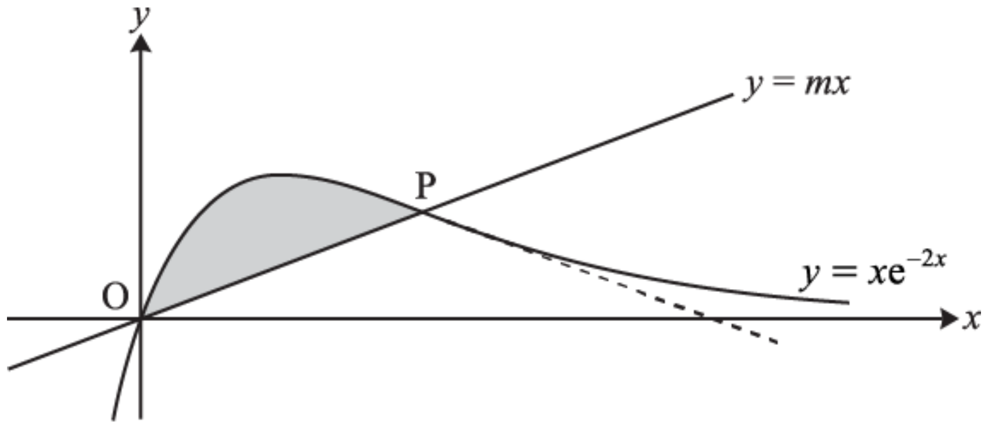


Fig. 9

i. Show that the x-coordinate of P is $-\frac{1}{2}\ln m$.

[3]

ii. Find, in terms of m, the gradient of the tangent to the curve at P.

[4]

You are given that OP and this tangent are equally inclined to the x-axis.

iii. Show that $m = e^{-2}$, and find the exact coordinates of P.

[4]

iv. Find the exact area of the shaded region between the line OP and the curve.

[7]

3. Find the exact value of $\int_1^2 x^3 \ln x \, dx$ ln x dx.

[5]

4. Find $\int_1^4 x^{-\frac{1}{2}}$ ln x dx, giving your answer in an exact form.

[5]

5. Find $\int x^2 e^{2x} dx$. [7]

6. Find $\int 4x^2 \sin 2x dx$. [6]

7. Using the substitution $x = e^u$, find $\int (\ln x)^2 dx$. [6]

8. Fig. 10 shows the graph of $y = (k - x)\ln x$ where k is a constant ($k > 1$).

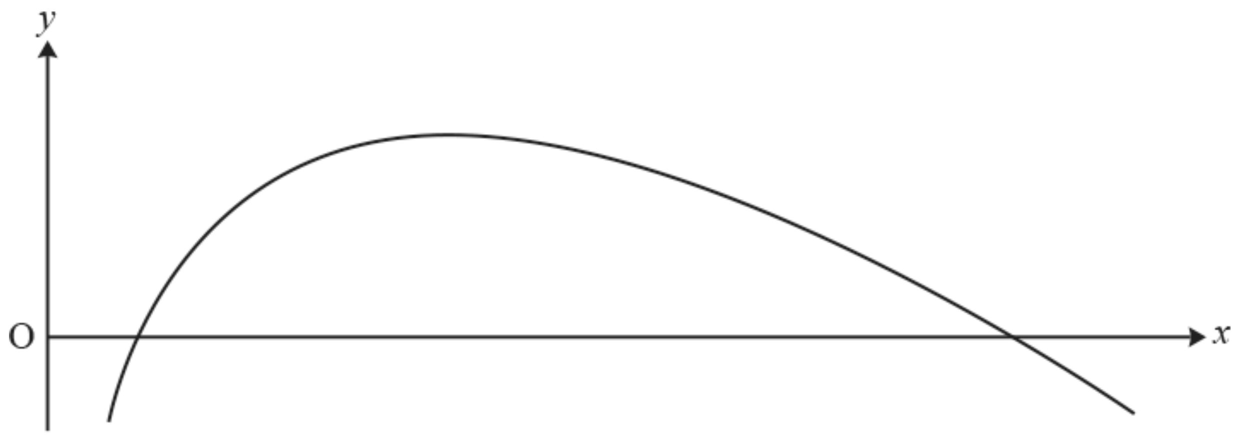


Fig. 10

Find, in terms of k, the area of the finite region between the curve and the x-axis. [8]

9. **In this question you must show detailed reasoning.**
Fig. 15 shows the graph of $y = 5xe^{-2x}$. Find the exact value of the area of the shaded region between the curve, the x-axis and the line parallel to the y-axis through the maximum point on the curve. [9]

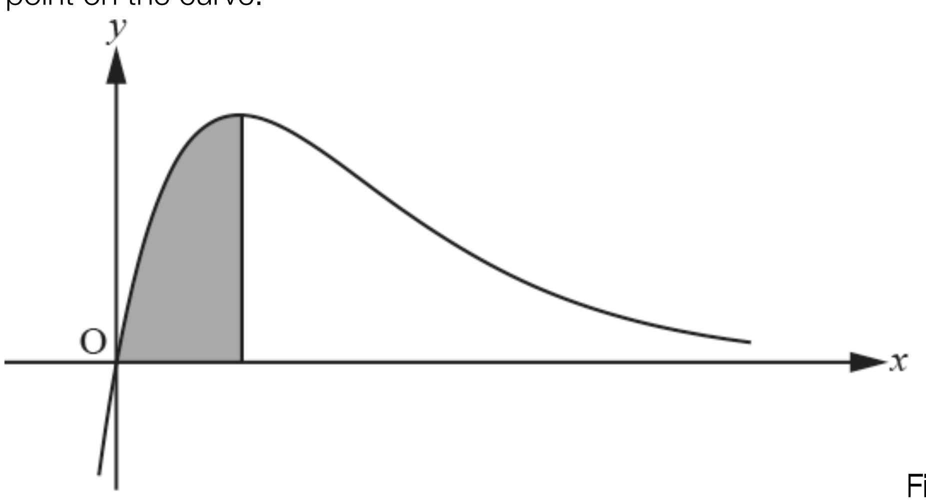


Fig. 15

10. **In this question you must show detailed reasoning.**

The curve $y = \ln x$ passes through the point (a, b), where $a > 1$.

The area A is bounded by the x-axis, the line $x = a$ and the curve $y = \ln x$.

The area B is bounded by the x-axis, the y-axis, the line $y = b$ and the curve $y = \ln x$.

The area A is equal in magnitude to the area B.

(a) Show that a satisfies the equation $pa \ln a + qa + r = 0$, where p, q and r are constants to be determined.

[7]

The value of a is found using the Newton-Raphson method on a spreadsheet. The output is shown in Fig. 15.

r	x_r
0	4
1	5.177399
2	4.931531
3	4.921571
4	4.921554

Fig. 15

Heidi states that the value of a is 4.921554 correct to 6 decimal places.

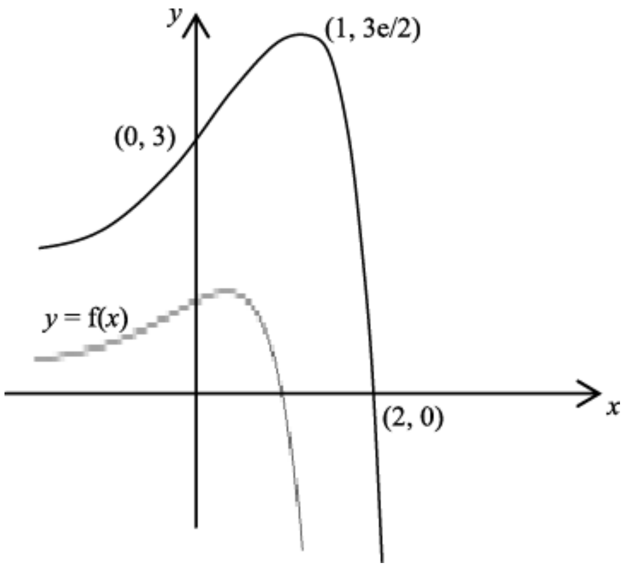
(b) Determine whether she is correct. [2]

END OF QUESTION paper

Mark scheme

Question			Answer/Indicative content	Marks	Part marks and guidance	
1		i	(1, 0) and (0, 1)	B1B1	$x = 0$, $y = 1$; $y = 0$, $x = 1$ Examiner's Comments The points of intersection were a write-down for many candidates. Weaker attempts failed to solve $(1 - x)\,e^{2x} = 0$ convincingly.	
		ii	$f'(x) = 2(1 - x)e^{2x} - e^{2x}$	B1	$d/dx(e^{2x}) = 2e^{2x}$	
		ii		M1	product rule consistent with their derivatives	
		ii	$= e^{2x}(1 - 2x)$	A1	correct expression, so $(1 - x)e^{2x} - e^{2x}$ is B0M1A0	
		ii	$f'(x) = 0$ when $x = ½$	M1dep	setting their derivative to 0 dep 1st M1	
		ii		A1cao	$x = ½$	
		ii	$y = ½\,e$	B1	allow ½ e^1 isw Examiner's Comments This proved to be an accessible 6 marks for candidates. The derivative of e^{2x} and the product rule were generally correct, and deriving $x = ½$ and $y = e^{1/2}$ was straightforward, though many did not simplify the derivative to $e^{2x} - 2xe^{2x}$ immediately. Some candidates approximated for $e^{1/2}$ and lost a mark.	

		iii	$A = \int_0^1 (1-x)\mathrm{e}^{2x}\mathrm{d}x$	B1	correct integral and limits; condone no dx (limits may be seen later)	
		iii	$u = (1-x),\ u' = -1,\ v' = \mathrm{e}^{2x},\ v = ½\,\mathrm{e}^{2x}$	M1	u, u', v', v, all correct; or if split up $u = x$, $u' = 1$, $v' = \mathrm{e}^{2x}$, $v = ½\ \mathrm{e}^{2x}$	
		iii	$\Rightarrow \quad A = \left[\frac{1}{2}(1-x)\mathrm{e}^{2x}\right]_0^1 - \int_0^1 \frac{1}{2}\mathrm{e}^{2x}.(-1)\mathrm{d}x$	A1	condone incorrect limits; or, from above, $\ldots\left[\frac{1}{2}x\mathrm{e}^{2x}\right]_0^1 - \int_0^1 \frac{1}{2}\mathrm{e}^{2x}\mathrm{d}x$	
		iii	$= \left[\frac{1}{2}(1-x)\mathrm{e}^{2x} + \frac{1}{4}\mathrm{e}^{2x}\right]_0^1$	A1	o.e. if integral split up; condone incorrect limits	
		iii	$= ¼\,\mathrm{e}^2 - ½ - ¼$ $= ¼\,(\mathrm{e}^2 - 3)$ *	A1cao	NB AG Examiner's Comments Most candidates applied integration by parts to either $\int(1-x)\,\mathrm{e}^{2x}\mathrm{d}x$ or $\int x\,\mathrm{e}^{2x}\mathrm{d}x$, using appropriate u, v', u' and v. Sign and/or bracket errors sometimes meant they failed to derive the correct result, but many were fully correct.	
		iv	$\mathrm{g}(x) = 3\mathrm{f}(½\,x) = 3(1 - ½\,x)\,\mathrm{e}^x$	B1	o.e; mark final answer	

		iv		B1 B1dep B1	through (2,0) and (0,3) – condone errors in writing coordinates (e.g. (0,2)). reasonable shape, dep previous B1 TP at (1, 3e/2) or (1, 4.1) (or better). (Must be evidence that $x = 1$, $y = 4.1$ is indeed the TP – appearing in a table of values is not enough on its own.) <u>Examiner's Comments</u> This part proved to be quite demanding. Deriving the formula for g(x) was rarely correctly done. Common errors were an extra factor of 3 and an incorrect exponent. Most graphs showed the correct points of intersection (0, 3) and (2, 0), but the turning point was quite often incorrect or missing, and the shape failed to convince.	
		v	$6 \times \frac{1}{4} (e^2 - 3)$ [$= 3(e^2 - 3)/2$]	B1	o.e. mark final answer <u>Examiner's Comments</u> Those, of the relatively few candidates, who got this correct just wrote down $2 \times 3 \times \frac{1}{4} (e^2 - 3)$. Some tried to integrate g(x), with little success.	
			Total	18		

2		i	$xe^{-2x} = mx$	M1	may be implied from 2nd line	
		i	$\Rightarrow e^{-2x} = m$	M1	dividing by x, or subtracting ln x	o.e. e.g. [ln x]– $2x$ = ln m + [ln x] or factorising: $x(e^{-2x} - m) = 0$
		i	$\Rightarrow -2x = \ln m$			
		i	$\Rightarrow x = -\frac{1}{2}\ln m$*	A1	NB AG	
		i	or			
		i	If $x = -\frac{1}{2}\ln m$, $y = -\frac{1}{2}\ln m \times e^{\ln m}$	M1	substituting correctly	
		i	$= -\frac{1}{2}\ln m \times m$	A1		
		i	so P lies on $y = mx$	A1	**Examiner's Comments** This was well answered, even by weaker candidates.	
		ii	let $u = x$, $u' = 1$, $v = e^{-2x}$, $v' = -2e^{-2x}$	M1*	product rule consistent with their derivs	
		ii	$dy/dx = e^{-2x} - 2xe^{-2x}$	A1	o.e. correct expression	
		ii	$= e^{-2.(-\frac{1}{2}\ln m)} - 2.(-\frac{1}{2}\ln m)e^{-2.(-\frac{1}{2}\ln m)}$	M1dep	subst $x = -\frac{1}{2}\ln m$ into their deriv dep M1* condone e^{1nm} not simplified	
		ii	$= e^{\ln m} + e^{\ln m}\ln m$ [$= m + m\ln m$]	A1cao	**Examiner's Comments** The product rule here was generally well done, followed by substituting x = - ½ ln m, where some sign errors occurred. Some left the eln m terms unresolved, which was condoned	but not – 2(– ½ ln m), but mark final ans

					here. The main error was to get a derivative of -2xe-2x.	
		iii	$m + m\ln m = -m$	M1	their gradient from (ii) = $-m$	
		iii	$\Rightarrow \ln m = -2$			
		iii	$\Rightarrow m = e^{-2}$*	A1	NB AG	
		iii	*or*			
		iii	$y + \frac{1}{2}m\ln m = m(1+\ln m)(x + \frac{1}{2}\ln m)$ $x = -\ln m$, $y = 0 \Rightarrow \frac{1}{2}m\ln m = m(1+\ln m)(-\frac{1}{2}\ln m)$ $\Rightarrow 1 + \ln m = -1$, $\ln m = -2$, $m = e^{-2}$	B2	for fully correct methods finding x intercept of equation of tangent and equating to $-\ln m$	
		iii	At P, $x = 1$	B1		
		iii	$\Rightarrow \quad y = e^{-2}$	B1	isw approximations **Examiner's Comments** The first two marks here were the least successfully answered, because most candidates were not familiar with the fact that lines equally inclined to the x-axis have gradients m and –m. Only the best candidates found the result successfully. However, many recovered to find the coordinates of P correctly.	not $e^{-2} \times 1$
		iv	Area under curve $= \int_0^1 xe^{-2x}\,dx$			
		iv	$u = x$, $u' = 1$, $v' = e^{-2x}$, $v = -\frac{1}{2}e^{-2x}$	M1	parts, condone $v = ke^{-2x}$, provided it is used consistently in their parts formula	ignore limits until 3[rd] A1
		iv	$= \left[-\frac{1}{2}xe^{-2x}\right]_0^1 + \int_0^1 \frac{1}{2}e^{-2x}\,dx$	A1ft	ft their v	

		iv	$=\left[-\frac{1}{2}xe^{-2x}-\frac{1}{4}e^{-2x}\right]_0^1$	A1	$-\frac{1}{2}xe^{-2x}-\frac{1}{4}e^{-2x}$ o.e	
		iv	$= (-\frac{1}{2}e^{-2} - \frac{1}{4}e^{-2}) - (0 - \frac{1}{4}e^0)$ $[= \frac{1}{4} - \frac{3}{4}e^{-2}]$	A1	correct expression	need not be simplified
		iv	Area of triangle = ½ base × height	M1	ft their 1, e^{-2} or $[e^{-2}x^2/2]$	o.e. using isosceles triangle
		iv	= ½ × 1 × e^{-2}	A1		M1 may be implied from 0.067 …
		iv	So area enclosed = ¼ − $5e^{-2}/4$	A1cao	o.e. must be exact, two terms only **Examiner's Comments** This question tested the more able candidates. The integration by parts required careful control of negative signs and accurate work; the area of the triangle (or integral of the line) were quite often discernable from the working, which was often scrambled and incoherent – perhaps because some candidates were rushing to complete the paper!	isw
			Total	18		
3			let $u = \ln x$, $dv/dx = x^3$, $du/dx = 1/x$, $v = \frac{1}{4}x^4$	M1	u, u', v', v all correct	
			$\int_1^2 x^3 \ln x \, dx = \left[\frac{1}{4}x^4 \ln x\right]_1^2 - \int_1^2 \frac{1}{4}x^4.\frac{1}{x}dx$	A1	$\frac{1}{4}x^4 \ln x - \int \frac{1}{4}x^4.\frac{1}{x}[dx]$	ignore limits
			$=\left[\frac{1}{4}x^4 \ln x\right]_1^2 - \int_1^2 \frac{1}{4}x^3 dx$	M1dep	simplifying $x^4/x = x^3$ in second term (soi)	dep 1st M1

			$= \left[\frac{1}{4}x^4 \ln x - \frac{1}{16}x^4\right]_1^2$	A1cao	$\frac{1}{4}x^4 \ln x - \frac{1}{16}x^4$ o.e. o.e. must be exact, but can isw Examiner's Comments There was a pleasing response to this question. Integration by parts was well understood by the majority of candidates, many of whom gained full marks. Very occasionally, uand v' were allocated to the wrong parts, and the other most common error was failing to simplify v u' before integrating this.	
			= 4ln 2 – 15/16	A1cao		must evaluate ln 1 = 0 and combine – 1 + 1/16
			Total	5		
4			let $u = \ln x$, $u' = 1/x$, $v' = x^{-1/2}$, $v = k\,x^{1/2}$	M1	soi ($k \neq 0$)	
			$\int x^{-1/2} \ln x[\mathrm{d}x] = \left[2x^{1/2} \ln x\right] - \int 2x^{1/2}.\frac{1}{x}[\mathrm{d}x]$	A1		
			$= \left[2x^{1/2} \ln x\right] - \int 2x^{-1/2}[\mathrm{d}x]$	M1	$x^{1/2} / x = x^{-1/2}$ or $1/x^{1/2}$ seen	
			$= \left[2x^{1/2} \ln x - 4x^{1/2}\right]_1^4$	A1	$2x^{1/2} \ln x - 4x^{1/2}$	may be integrated separately
			= 4 ln 4 – 8 – (2ln 1 – 4)			
			= 4 ln 4 – 4	A1cao	oe (eg ln 256 – 4) but must evaluate ln 1 = 0	mark final answer Examiner's Comments Integration by parts was well understood, with just under half candidates scoring full marks for this question. Very occasionally, candidates

						took $u = x^{-1/2}$ and $v' = \ln x$, and were unable to score any marks. With u and v correct, the next hurdle is to simplify the $2x^{1/2}.1/x$ integrand, and some failed at this stage, and attempted to integrate the product term by term. Having negotiated this successfully, most got full marks, though very occasionally the final answer was spoiled by using 4ln4 = ln16.
			Total	5		
5			let $u = x^2$, $u' = 2x$, $v' = e^{2x}$, $v = \frac{1}{2}e^{2x}$ $\int x^2e^{2x}dx = \frac{1}{2}x^2e^{2x} - \int 2x.\frac{1}{2}e^{2x}dx = \frac{1}{2}x^2e^{2x} - \int xe^{2x}dx$ let $u = x$, $u' = 1$, $v' = e^{2x}$, $v = \frac{1}{2}e^{2x}$ $\int xe^{2x}dx = \frac{1}{2}xe^{2x} - \int \frac{1}{2}e^{2x}dx$ $= \frac{1}{2}xe^{2x} - \frac{1}{4}e^{2x}(+c)$ so $\int x^2e^{2x}dx = \frac{1}{2}x^2e^{2x} - \frac{1}{2}xe^{2x} + \frac{1}{4}e^{2x} + c$	M1A1(AO1.1a 1.2) A1(AO1.1) M1(AO1.1a) A1(AO1.1) A1(AO1.1) A1(AO2.5) [7]	Do not	

					award if no '+ *c*'	
			Total	7		
6			$-4x^2 \times \frac{\cos 2x}{2} - \int (-8x) \times \frac{\cos 2x}{2} \, \mathrm{d}x$ $4x \times \frac{\sin 2x}{2} - \int 2 \sin 2x \mathrm{d}x$ $-2x^2 \cos 2x + 2x \sin 2x - \int 2 \sin 2x \mathrm{d}x$ $-2x^2 \cos 2x + 2x \sin 2x - \left(\frac{-2 \cos 2x}{2} \right) + c$ $-2x^2 \cos 2x + 2x \sin 2x + \cos 2x + c$	M1(AO3.1a) A1(AO1.1b) M1(AO2.1) A1(AO1.1b) M1(AO2.1) A1(AO1.1b) [6]	Integration by parts, allow sign errors only for **M1** all correct Integration by parts, allow sign errors only for **M1** convincing attempt, allow sign error and/or omission of + *c* at this	

					stage all correct AG	
		Total	6			
7			Use $x = e^u$ and $\frac{dx}{du} = e^u$ $\int (\ln x)^2 \, dx = \int (\ln e^u)^2 e^u \, du = \int u^2 e^u \, du$ Use integration by parts $= u^2 e^u - \int 2u e^u \, du$ $= u^2 e^u - 2(u e^u - \int u^0 e^u \, du)$ $= u^2 e^u - 2u e^u + 2e^u + c$ $= x(\ln x)^2 - 2x \ln x + 2x + c$	M1(AO1.1b) A1(AO1.1b) M1(AO3.1a) A1(AO1.1b) M1(AO1.1a) A1(AO1.1b) [6]	Using substitution including dx Simplifying correctly First use of integration by parts First stage all correct Second use of integration by parts Must be in terms of x for final mark	

			Total	6		
8			Curve crosses the x-axis when $y = 0$ $y = (k - x)\ln x = 0$ Either $k - x = 0$ or $\ln x = 0$ $x = k$ or 1 EITHER $$\text{Area} = \int_1^k (k-x)\ln x \, dx$$ Let $u = \ln x, \quad \frac{dv}{dx} = k - x, \quad \frac{du}{dx} = \frac{1}{x}, \quad v = kx - \frac{1}{2}x^2$ $$\text{Area} = \left[\left(kx - \tfrac{1}{2}x^2\right)\ln x\right]_1^k - \int_1^k \frac{1}{x}\left(kx - \tfrac{1}{2}x^2\right) dx$$ $$\left[\left(kx - \tfrac{1}{2}x^2\right)\ln x\right]_1^k - \int_1^k \left(k - \tfrac{1}{2}x\right) dx$$ $$\left[\left(kx - \tfrac{1}{2}x^2\right)\ln x - \left(kx - \tfrac{1}{4}x^2\right)\right]_1^k$$	M1 (AO 3.1a) A1 (AO 1.1b) M1 (AO 2.1) A1 (AO 1.1b) M1 (AO 3.1a) A1 (AO 1.1b) M1dep (AO 1.1a) A1 (AO 1.1b)	Attempt to solve $y = 0$ Both roots required Using integration by parts with $u = \ln x$, $\frac{dv}{dx} = k - x$ clearly argued Allow without limits	

			Answer	Marks	Guidance	
			$\left(\left(k^2-\frac{1}{2}k^2\right)\ln k-\left(k^2-\frac{1}{4}k^2\right)\right)$ $-\left(\left(k-\frac{1}{2}\right)\ln 1-\left(k-\frac{1}{4}\right)\right)$ $=\frac{1}{2}k^2\ln k-\frac{3}{4}k^2+k-\frac{1}{4}$	[8]	Simplifying the integrand Second part correct Using limits. Dependent on M mark for integration by parts Cao	
			OR Integral split into two separate integrals $\int_1^k k\ln x\ \mathrm{d}x$	M1		
			Let $u=\ln x,\quad \frac{\mathrm{d}v}{\mathrm{d}x}=k,\quad \frac{\mathrm{d}u}{\mathrm{d}x}=\frac{1}{x},\quad v=kx$	M1		
			$=\left[kx\ln x\right]_1^k-\int_1^k\frac{1}{x}kx\ \mathrm{d}x$ $\left[kx\ln x\right]_1^k-\int_1^k k\ \mathrm{d}x=\left[kx\ln x-kx\right]_1^k$ $(k^2\ln k-k^2)-(k\ln 1-k)=k^2\ln k-k^2+k$ And	M1dep	Using integration by parts with $u=\ln x$, $\frac{\mathrm{d}v}{\mathrm{d}x}=k$ or $u=\ln x$, $\frac{\mathrm{d}v}{\mathrm{d}x}=\pm x$ clearly	

			Answer	Marks	Guidance		
			$\text{Area} = \int_1^k x\ln x \, dx$	A1	argued		
			Let $u = \ln x, \quad \frac{dv}{dx} = x, \quad \frac{du}{dx} = \frac{1}{x}, \quad v = \frac{1}{2}x^2$		Simplifying the integrand		
			$= \left[\frac{1}{2}x^2 \ln x\right]_1^k - \int_1^k \frac{1}{x} \times \frac{1}{2}x^2 dx$	A1			
			$\left[\frac{1}{2}x^2 \ln x\right]_1^k - \int_1^k \frac{1}{2}x \, dx$				
			$\left[\frac{1}{2}x^2 \ln x - \frac{1}{4}x^2\right]_1^k$	A1	Substituition of limits seen in at least one integral. Dependendent on M mark for integration by parts		
			$\left(\frac{1}{2}k^2 \ln k - \frac{1}{4}k^2\right) - \left(\frac{1}{2}\ln 1 - \frac{1}{4}\right) = \frac{1}{2}k^2 \ln k - \frac{1}{4}k^2 + \frac{1}{4}$				
			$\text{Area } = \left(k^2 \ln k - k^2 + k\right) - \left(\frac{1}{2}k^2 \ln k - \frac{1}{4}k^2 + \frac{1}{4}\right)$				
			$= \frac{1}{2}k^2 \ln k - \frac{3}{4}k^2 + k - \frac{1}{4}$		Both integrals correct at this stage Allow without limits		
					Both integrals fully correct Allow without limits		

Cao	

Examiner's Comments

This is an exemplar of a question requiring an extended answer – there are 4 method marks in the scheme. Candidates had to structure their answer. Had a value for k been given, the definite integral would have been possible on many calculators and the question may have become a "detailed reasoning" question.

Successful candidates generally used

integration by parts with	$\frac{dv}{dx} = k - x$	. It

needed much more work to expand the bracket and split the integral in two. Some candidates lost the final mark, as they did not tidy up their answer so had too many terms.

AfL In an unstructured question like this one, do not give up or leave it blank because you do not know how to calculate the limits. Find the indefinite integral to make sure of 4 out of 8 marks. Using

					incorrect limits could also have been credited a method mark.	
			Total	8		
9			$\frac{dy}{dx} = 5x(-2e^{-2x}) + 5e^{-2x}$ $e^{-2x}(-10x + 5) = 0$ $x = \frac{1}{2}$ $\text{Area} = \int_0^{\frac{1}{2}} 5x e^{-2x}\, dx$ $= \left[5x\left(-\frac{1}{2}e^{-2x}\right)\right]_0^{\frac{1}{2}} - \int_0^{\frac{1}{2}}\left(-\frac{5}{2}e^{-2x}\right) dx$	M1 (AO 3.1a) A1 (AO 1.1) M1 (AO 1.1a) A1 (AO 1.1) M1 (AO 3.1a) M1 (AO 1.1a) A1 (AO 1.1) A1 (AO 1.1) A1 (AO 1.1) [9]	For use of product rule For correct (unsimplified) derivative For equating derivative to zero and attempting to solve for *x* oe Limits 0 and (their) $\frac{1}{2}$ must be seen at some stage for this mark to be awarded For	

			$= -\frac{5}{4}e^{-1} + \left[-\frac{5}{4}e^{-2x}\right]_0^{\frac{1}{2}}$ $= -\frac{5}{2}e^{-1} + \frac{5}{4}$		integration by parts with $u = 5x$ and $v' = e^{-2x}$ First stage all correct; ignore limits for this mark Integration completed correctly oe, but must be exact simplified form	Not e.g. 0.3303…
			Total	9		
10		a	$\ln a = b$ Area B: $\int_0^b e^y dy = e^b - e^0$ $= a - 1$ Area A: $\int_1^a \ln x \, dx = [x \ln x - x]_1^a$	B1 (AO 1.1) M1(AO 3.1a) A1(AO 1.1) M1(AO 2.1) A1(AO 1.1) M1(AO 3.1a) A1(AO 1.1) [7]	or $a \times b -$ their $a\ln a - a + 1$	

			$= a\ln a - a + 1$ Their $a - 1$ = their $a\ln a - a + 1$ $a\ln a - 2a + 2 = 0$			
		b	Evaluation of their f(4.921554 − δ) and their f(4.921554 + δ) eg − 0.000000079882 and 0.000000513742 seen to 2 or more sf plus correct conclusion: sign change, so Heidi is correct	M1 (AO 2.1) A1(AO 2.2a) [2]	$\delta \leq 0.000\ 000\ 5$	
			Total	9		