Question	Scheme	Marks
9	**Area under the curve**	
	$A_c = \int_{-1}^{0}\left(-2e^{3x}+4\right)dx, = \left[\frac{-2e^{3x}}{3}+4x\right]_{-1}^{0}$	M1M1
	$\Rightarrow\left(\frac{-2e^{3\times 0}}{3}+4\times 0\right)-\left(\frac{-2e^{3\times -1}}{3}+4\times -1\right), = \frac{10}{3}+\frac{2e^{-3}}{3}$	M1A1
	Area under trapezium	
	Method 1 [uses formula for the area of a trapezium]	
	$y=2 \quad y=-2e^{-3}+4$	
	$A_T = \frac{1}{2}\times 1\times\left('2'+'-2e^{-3}+4'\right)=\left[3-e^{-3}\right]$	B1
	Method 2 [finds equation of the line and integrates]	M1
	Equation of the line: $y=\left(2e^{-3}-2\right)x+2 \quad \left(\text{accept } y=-1.9x+2\right)$	
	$A_T = \int_{-1}^{0}'\left(\left(2e^{-3}-2\right)x+2\right)'\,dx = \left[\frac{'\left(2e^{-3}-2\right)'x^2}{2}+\frac{'2'x}{2}\right]_{-1}^{0} = \left[3-e^{-3}\right]$	
	Shaded Area	
	$A_{shaded} = \left(\frac{10}{3}+\frac{2e^{-3}}{3}\right)-\left(3-e^{-3}\right)=\frac{1+5e^{-3}}{3}$	M1A1 [8]
		Total 8 marks

Mark	Notes
M1	For a correct statement for the area under the curve with **correct limits**. This mark can be implied/embedded by later correct work. **Condone missing dx**
M1	Attempts to integrate the given curve to a form of $Ae^{3x} + Bx$ **Ignore limits for this mark**.
M1	For substituting in both of their limits into their integrated expression in the form $Ae^{3x} + Bx$ and subtracts. (*A, B* are nonzero constants) Correct exact answer $\frac{10}{3} + \frac{2e^{-3}}{3}$ implies the correct substitution. If their answer is not correct and exact, explicit substitution needs to be seen.
A1	For the correct **exact** area under the curve. If not seen explicitly, this can be implied by correct exact final answer.
Method 1 - trapezium	
B1	For both correct **exact** values of y
M1	For the correct method of finding area of the trapezium using their values for y Look for $\frac{1}{2} \times 1 \times (sum\ of\ their\ y\ values)$
Method 2 – equation of line	
B1	For the correct equation of the line L, must reach $y = \ldots$ $y = \left(2e^{-3} - 2\right)x + 2 \quad \left(\text{accept } y = -1.9x + 2\right)$
M1	For the correct area under the line L using their line. Check for correct integration of their line and full substitution of – 1 if their area is incorrect. (If the terms are equal to zero, substitution of 0 does not need to be seen.) Allow also $A_T = \int_{-1}^{0} '(-1.9x + 2)' \, dx = \left[\frac{'-1.9'x^2}{2} + \frac{'2'x}{2}\right]_{-1}^{0}$
Combines the areas	
M1	Correct strategy to find the value of shaded area The integrated area of the curve - the area of trapezium
A1	For the correct **exact** area of the shaded region in the required form

Some candidates are combining the curve – line in one calculation – mark this as follows.

- Wherever you see the **correct** equation of the line, score the 5th Mark [B mark]
- Mark the work for the curve (which may be embedded in a combined integral) using the first 4 marks.
- Mark the area under the line using the 6th mark [M mark – using their equation in the form $y = mx + c$]
- When you see them subtracting the areas – award the penultimate M mark
  If they add the areas, this is M0
- Final A mark is for the correct answer only