Q	Solution	Marks	Total	Comments
(a)	$y = e^x \to e^{2x} - 1$ Stretch (I) scale factor $\frac{1}{2}$ (II)	M1		I + (II or III)
	in x-direction (III)	A1		I + II + III
	Translation	E1		Allow "translate"
	$\begin{bmatrix} 0 \\ -1 \end{bmatrix}$	B1	4	OE "1 unit down" etc
(b)	$x = 0 \quad y = 6$ or $(0, 6)$	B1	1	Both coordinates must be stated, not simply 6 marked on diagram
(c)(i)	$e^{2x} - 1 = 4e^{-2x} + 2$ $e^{4x} - e^{2x} = 4 + 2e^{2x}$ or $\left(e^{2x}\right)^2 - e^{2x} = 4 + 2e^{2x}$	M1		Multiplying both sides by e^{2x}
	$(e^{2x})^2 - 3e^{2x} - 4 = 0$	A1	2	AG With no errors seen
(ii)	$\left(e^{2x} - 4\right)\left(e^{2x} + 1\right)$	M1		$\left(e^{2x} \pm 4\right)\left(e^{2x} \pm 1\right)$
	$x = \ln 2$ or $\frac{1}{2}\ln 4$	A1		
	Reject $e^{2x} = -1$ OE	A1	3	eg $e^{2x} > 0$, $e^{2x} \neq -1$, impossible etc
(d)	$\int\left(4e^{-2x} + 2\right)\, dx$ (I) $= \left[\frac{4e^{-2x}}{-2} + 2x\right]_0^{\ln 2}$	M1		I or II attempted and e^{-2x} or e^{2x} integrated correctly
	$= \left(\frac{4e^{-2\ln 2}}{-2} + 2\ln 2\right) - \left(\frac{4}{-2} + 0\right)$	m1		F['their $\ln 2$' from (c)(ii)] $-$ F[0]
	$= -\frac{1}{2} + 2\ln 2 + +2 = \frac{3}{2} + 2\ln 2$ $\int\left(e^{2x} - 1\right)\, dx$ (II) $= \left[\frac{e^{2x}}{2} - x\right]_0^{\ln 2}$	A1		Both I and II correctly integrated
	$= \left(\frac{e^{2\ln 2}}{2} - \ln 2\right) - \left(\frac{1}{2} - 0\right)$ $= 2 - \ln 2 - \frac{1}{2} = \frac{3}{2} - \ln 2$			
	$A = \left(\frac{3}{2} + 2\ln 2\right) - \left(\frac{3}{2} - \ln 2\right)$	B1$\surd$		Attempt to find difference of 'their I – their II'
	$= 3\ln 2$ or $\ln 8$ or $\frac{3}{2}\ln 4$ OE	A1	5	CSO must be exact