9	**(a)**		$e^{kt} > 0$ for all t, so $y > 0$ for $t \geq 0$ (or for all t) hence never crosses x-axis	**B1** **[1]**	**2.4**	Or show that $2e^{-3t} = 0$ has no solutions	Need to see $y \neq 0$ or $y > 0$ and reason relating to exponential (or logarithmic) function Must clearly be referring to y or $2e^{-3t}$
	(b)		$e^{2t} - 4e^{t} + 3 = 0$ $(e^{t} - 1)(e^{t} - 3) = 0$ $e^{t} = 1,\ e^{t} = 3$ $t = 0,\ t = \ln 3$	**M1** **A1** **[2]**	**3.1a** **1.1**	Equate to 0 and attempt to solve disguised quadratic Obtain both correct values	'determine' so some evidence of method needed A0 for ln1 and not 0
	(c)		$\frac{dx}{dt} = 2e^{2t} - 4e^{t}$	**B1**	**1.1**	Correct $\frac{dx}{dt}$	Mark derivative and condone no/wrong label

Question	Answer	Marks	AO	Guidance	
	$\frac{dy}{dt} = -6e^{-3t}$	**B1**	**1.1**	Correct $\frac{dy}{dt}$	Mark derivative and condone no/wrong label
	$\frac{dy}{dx} = \frac{-6e^{-3t}}{2e^{2t} - 4e^{t}}$	**M1**	**2.4**	Attempt correct method to combine derivatives	Combine their derivatives correctly
	$\frac{dy}{dx} = \frac{-3e^{-3t}}{e^{2t} - 2e^{t}} = \frac{3}{e^{3t}\left(2e^{t} - e^{2t}\right)} = \frac{3}{2e^{4t} - e^{5t}}$ **A.G.**	**A1**	**2.1**	Show manipulation to given answer	Need to see some evidence of how e^{-3t} is dealt with **AG** so method must be fully correct
		[4]			
(d)	$2e^{4t} - e^{5t} = 0$	**M1**	**3.1a**	Equate denominator to 0	Or $\frac{dx}{dy} = 0$ or $\frac{dx}{dt} = 0$
	$e^{4t}\left(2 - e^{t}\right) = 0$	**A1**	**1.1**	Solve for t to obtain $t = \ln 2$	No need to see $e^{4t} = 0$ discounted
	$t = \ln 2$				
	$(-1, \frac{1}{4})$	**A1**	**1.1**	Obtain correct coordinate	Or $x = -1$, $y = \frac{1}{4}$
		[3]			