Question	Answer	Marks	Guidance
3(a)	$\left(2e^{3x}-5\right)\left(e^{3x}+1\right)=0$	**M1**	For attempt to solve a 3-term quadratic equation in e^{3x}, or using an appropriate substitution. May also be implied by correct use of quadratic formula
	$x=\frac{1}{3}\ln\frac{5}{2}$	**2**	**Dep M1** for a correct attempt to obtain x = … **A1** cao with negative root discounted.
3(b)	$e^{-x-7-7y}=e^{-2}$	**M1**	For correct attempt to deal with powers of e
	$x+7y=-5$	**A1**	
	$x^2+5x-126=0$ or $7y^2+5y-18=0$	**M1**	**Dep** for attempt to obtain a 3-term quadratic equation equated to zero in either x or y
	$x=-14,\ \ x=9$	**A1**	For both
	$y=\frac{9}{7},\ \ y=-2$	**A1**	For both
4(a)	Intercept = –2 soi	**B1**	
	$e^{4y}=\frac{2}{5}x-2$	**M1**	For attempt at straight line equation with *their* intercept
	$y=\frac{1}{4}\ln\left(\frac{2}{5}x-2\right)$ oe	**A1**	
4(b)	$y=\frac{1}{4}\ln 16$	**M1**	**Dep** on **M1** in part (a)
	$y=\ln 2$	**A1**	
4(c)	$x>5$	**1**	
5(a)	Acceleration $=18\cos 3t$	**2**	**B1** for $k\cos 3t$, $k\neq 2,\ k>0$
	$\cos 3t=-\frac{1}{2}$ oe	**M1**	For attempt to solve *their* $\cos 3t=-\frac{1}{2}$ to obtain a value for t
	$t=\frac{2\pi}{9}$ or 0.698	**A1**	

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td rowspan="5">5(b)</td><td>$-2\cos 3t \quad (+c)$</td><td>2</td><td>B1 for $k\cos 3t$, $k \neq 18$, $k < 0$</td></tr>
<tr><td>Displacement $= 2 - 2\cos 3t$</td><td>M1</td><td>For attempt to find value of c</td></tr>
<tr><td>2.92</td><td>A1</td><td></td></tr>
<tr><td>Alternative
$-2\cos 3t$</td><td>(2)</td><td>B1 for $k\cos 3t$, $k \neq 18$, $k < 0$</td></tr>
<tr><td>$\left[-2\cos 3t\right]_0^{5.6}$
$= \left(-2\cos 16.8\right) - \left(-2\right)$</td><td>(M1)</td><td>For correct application of limits using their $k\cos 3t$, $k \neq 18$, $k < 0$</td></tr>
<tr><td>2.92</td><td>(A1)</td><td></td></tr>
<tr><td>6(a)</td><td><table><tr><th>Expression</th><th>Function notation</th></tr><tr><td>0</td><td>g″</td></tr><tr><td>$4x$</td><td>f′</td></tr><tr><td>$8x^2 + 8x + 2$</td><td>fg</td></tr><tr><td>$4x + 3$</td><td>g^2</td></tr><tr><td>$\frac{x-1}{2}$</td><td>g^{-1}</td></tr></table></td><td>5</td><td>B1 for each one correct</td></tr>
<tr><td>6(b)(i)</td><td>$a = 1$</td><td>B1</td><td></td></tr>
<tr><td>6(b)(ii)</td><td>$\text{h}(x) \geqslant 3$</td><td>B1</td><td></td></tr>
<tr><td rowspan="3">6(b)(iii)</td><td>$x = (y-1)^2 + 3$
$y = 1 + \sqrt{x-3}$</td><td>M1</td><td>For a correct attempt to find the inverse, allow one sign error</td></tr>
<tr><td>$\text{h}^{-1}(x) = 1 + \sqrt{x-3}$</td><td>A1</td><td>Must be using correct notation</td></tr>
<tr><td>$x \geqslant 3$</td><td>B1</td><td>Must be using correct notation</td></tr>
</table>

© UCLES 2022