Question	Answer	Marks	Guidance
1(a)	3	**B2**	**B1** for g(0) = 0 or [fg(x) =] $2\sin(e^{3x} - 1) + 3\cos(e^{3x} - 1)$ soi
1(b)	$gg(x) = e^{3\left(e^{3x}-1\right)} - 1$ oe, isw	**B1**	
1(c)	$3y = \ln(x+1)$ or $3x = \ln(y+1)$ **and** swops the variables at some point	**M1**	condone one error
	$g^{-1}(x) = \frac{1}{3}\ln(x+1)$ soi	**A1**	
	[x =] 4	**A1**	
	Alternative method		
	$x = g(\frac{1}{3}\ln 5)$ soi	**(B1)**	
	$e^{3\left(\frac{1}{3}\ln 5\right)} - 1$ oe	**(M1)**	
	[x =] 4	**(A1)**	
2	Uses $b^2 - 4ac$ [*0] $k^2 - 4(4k - 15)$ [*0]	**M1**	where * is any inequality sign or =;
	$k^2 - 16k + 60$ [*0]	**A1**	
	$(k-6)(k-10)$[*0]	**DM1**	**FT** *their* 3-term quadratic; **dep** on previous **M1**
	$6 < k < 10$	**A1**	Mark final answer
	Alternative method		
	$2x + k$ [= 0]	**(M1)**	
	$-\frac{k^2}{4} + 4k - 15$[*0] oe or $-x^2 - 8x - 15$[*0] oe	**(A1)**	
	Solves or factorises $(k-6)(k-10)$[*0] or $(x + 5)(x + 3)$ [*0] **and** $x = -5$, $x = -3$	**(DM1)**	**FT** *their* 3-term quadratic; **dep** on previous **M1**
	$6 < k < 10$	**(A1)**	Mark final answer

Question	Answer	Marks	Guidance
3(a)	Correctly eliminates $\log_2 x$ or $\log_2 y$	**M1**	A correct equation in $\log_2 x$ only or $\log_2 y$ only
	$x = 16$ or $y = 64$	**A2**	**A1** for $\log_2 x = 4$ or $\log_2 y = 6$
	$y = 64$ or $x = 16$	**A2**	**A1** for $\log_2 y = 6$ or $\log_2 x = 4$
	Alternative method		
	$x^3y^2 = 2^{24}$ **and** $\frac{x^5}{y^3} = 2^2$ oe	**(M1)**	
	$y = 64$ or $x = 16$	**(A2)**	**A1** for $y^{19} = 2^{114}$ oe or $x^{19} = 2^{76}$ oe
	$x = 16$ or $y = 64$	**(A2)**	**A1** for $x^3 \times 64^2 = 2^{24}$ oe or $\frac{x^5}{64^3} = 2^2$ oe OR $16^3 \times y^2 = 2^{24}$ oe or $\frac{16^5}{y^3} = 2^2$ oe
3(b)	$2^{t+4-(1-2t)} = 2^9$ or $2^{t+4} = 2^{9+1-2t}$ oe, soi OR $t + 4 - (1 - 2t) = \log_2 512$ oe, soi or $t + 4 - (1 - 2t) = \frac{\log_a 512}{\log_a 2}$ oe	**B2**	**B1** for $2^{t+4-(1-2t)} = 512$ or $\frac{2^{t+4}}{2^{1-2t}} = 2^9$ soi OR $(t + 4)\log_a 2 - (1 - 2t)\log_a 2 = \log_a 512$
	$3t + 3 = 9$ or better	**M1**	
	$t = 2$	**A1**	