Question	Answer	Marks	Guidance
9(a)	$-\frac{5}{2}$ oe	**B1**	
9(b)	$f \in \mathbb{R}$ oe	**B1**	
9(c)	$\ln\left(2\left(x^2+1\right)+5\right)$ $[=4]$ oe, soi	**B1**	
	$2\left(x^2+1\right)+5=e^4$ or *their* $(2x^2 + 7) = e^4$	**M1**	
	$x=\pm\sqrt{\frac{e^4-7}{2}}$ or exact equivalent	**A1**	
	Alternative method		
	Solves $\ln(2x+5)=4$ to find $x=\frac{e^4-5}{2}$ and states $g(x)=\frac{e^4-5}{2}$ OR finds $f^{-1}(x)=\frac{e^x-5}{2}$ and states $g(x)=\frac{e^4-5}{2}$	**(2)**	**M1** for solving $f(x)=4$ to find $x = k$ and states $g(x)=k$, where k is a constant OR for stating $g(x)=f^{-1}(4)$
	$x^2+1=\frac{e^4-5}{2}\rightarrow\ x=\pm\sqrt{\frac{e^4-5}{2}-1}$ or exact equivalent	**(A1)**	

Question	Answer	Marks	Guidance
10	Writes as a 3-term quadratic in e^x in solvable form: $3e^{2x}+5e^x-2[=0]$ soi	**M1**	condone one sign or arithmetic error
	Solve or factorises *their* 3-term quadratic in e^x	**M1**	**dep** previous **M1**
	$e^x=\frac{1}{3}$ or $e^x = 0.333[3...]$ $\left[e^x=-2\right]$	**A1**	
	$x=\ln\frac{1}{3}$ or $-\ln 3$ only solution, nfww	**A1**	must be exact value, but ignore decimal if also stated
	Correct plan: $\int_{their\ln\frac{1}{3}}^{0}\left(3e^{2x}+5e^x-2\right)dx$ OR $\int_{their\ln\frac{1}{3}}^{0}\left(2+5e^x\right)dx-\int_{their\ln\frac{1}{3}}^{0}\left(4-3e^{2x}\right)dx$ soi	**M1**	**dep** on use of $2+5e^x=4-3e^{2x}$ to find the lower limit
	$\frac{3}{2}e^{2x}+5e^x-2x$ OR $\left(2x+5e^x\right)$ and $\left(4x-\frac{3}{2}e^{2x}\right)$	**B2**	**B1** for $\left[\int 3e^{2x}dx=\right]\ \frac{3}{2}e^{2x}$ soi **B1** for all other terms correct
	$\frac{3}{2}+5-\left(\frac{3}{2}e^{2\ln\frac{1}{3}}+5e^{\ln\frac{1}{3}}-2\ln\frac{1}{3}\right)$ OR $5-\left(2\ln\frac{1}{3}+5e^{\ln\frac{1}{3}}\right)$ OR $-\frac{3}{2}-\left(4\ln\frac{1}{3}-\frac{3}{2}e^{2\ln\frac{1}{3}}\right)$ oe	**M1**	**FT** correct substitution of limits 0 and k where k is exact into $ae^{2x}+be^x+cx$ or ae^x+bx or $ae^{2x}+bx$ at least once, providing limits are consistent
	$\frac{14}{3}-2\ln 3$ **dep** on all previous marks awarded	**2**	**M1 dep** on correct plan for one correct term out of two or for $a+2\ln\frac{1}{3}$ with constant a
11(a)	$[\tan 2x=0\rightarrow]$ Any two of $2x=0,\quad 180,\quad 360$	**M1**	
	$[x=]$ 0, 90, 180 nfww and no extras from $\tan 2x = 0$ in range $0 \leqslant x \leqslant 180$	**A1**	
	$[\tan 2x=4\rightarrow]$ $2x=$ 75.96... or 255.96...	**M1**	
	38 [.0] or 37.98[18…] isw 128 [.0] or 127.98[18…] isw and no extras from $\tan 2x = 4$ in range $0 \leqslant x \leqslant 180$	**A1**	

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