Question Number	Scheme	Notes	Marks
1(a)	$4\sinh^3 x+3\sinh x=4\left(\frac{e^x-e^{-x}}{2}\right)^3+3\left(\frac{e^x-e^{-x}}{2}\right)$ $=4\left(\frac{e^{3x}-3e^x+3e^{-x}-e^{-3x}}{8}\right)+3\left(\frac{e^x-e^{-x}}{2}\right)$ Uses $\sinh x=\frac{e^x-e^{-x}}{2}$ on both sinh terms and attempts to cube the bracket (min accepted is a linear x a quadratic bracket)		M1
	$=\frac{1}{2}e^{3x}-\frac{3}{2}e^x+\frac{3}{2}e^{-x}-\frac{1}{2}e^{-3x}+\frac{3}{2}e^x-\frac{3}{2}e^{-x}$ $=\frac{e^{3x}-e^{-3x}}{2}=\sinh 3x$*		A1*
			(2)
(b)	$\sinh 3x=19\sinh x\Rightarrow 4\sinh^3 x+3\sinh x=19\sinh x$ $\Rightarrow 4\sinh^3 x-16\sinh x=0$ Uses the result from (a) and combines terms		M1
	$(\sinh x=0$ or) $\sinh^2 x=4$	$\sinh^2 x=4$ or $\sinh x=(\pm)2$	A1
	(0, 0)	States the origin as one intersection	B1
	$\ln\left(2+\sqrt{5}\right)$ **and** $-\ln\left(2+\sqrt{5}\right)$	Two correct non-zero x values(allow e.g. $\ln\left(-2+\sqrt{5}\right)$ for $-\ln\left(2+\sqrt{5}\right)$)	A1
	$\left(\ln\left(2+\sqrt{5}\right),38\right)$ **and** $\left(-\ln\left(2+\sqrt{5}\right),-38\right)$	Two correct **points** (allow e.g. $\ln\left(-2+\sqrt{5}\right)$ for $-\ln\left(2+\sqrt{5}\right)$)	A1
			(5)
	Alternative for (b) using exponentials		
	$\sinh 3x=19\sinh x\Rightarrow\frac{e^{3x}-e^{-3x}}{2}=\frac{19\left(e^x-e^{-x}\right)}{2}\Rightarrow\ldots$ Substitutes the correct exponential forms and collects terms to one side		M1
	$\Rightarrow e^{6x}-19e^{4x}+19e^{2x}-1=0$	Correct equation (or equivalent)	A1
	(0, 0)	States the origin as one intersection	B1
	$\frac{1}{2}\ln\left(9+4\sqrt{5}\right)$ **or** $\frac{1}{2}\ln\left(9-4\sqrt{5}\right)$	Two correct non-zero x values (oe)	A1
	$\left(\frac{1}{2}\ln\left(9+4\sqrt{5}\right),38\right)$ **and** $\left(\frac{1}{2}\ln\left(9-4\sqrt{5}\right),-38\right)$	Two correct **points** (oe)	A1
			Total 7