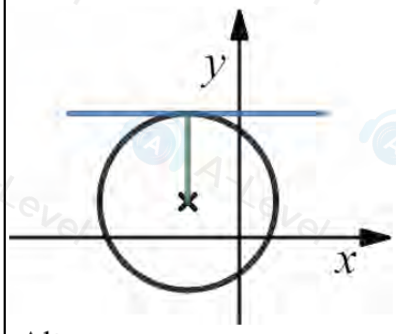
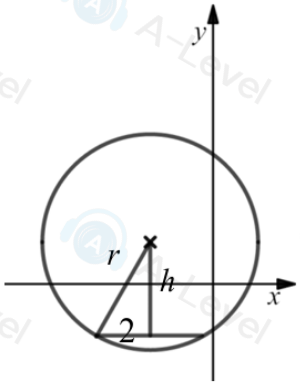
Question Number	Scheme	Marks
7 (i)	States or uses $\tan x = \dfrac{\sin x}{\cos x}$	M1
	$3\sin x\tan x = 11+\cos x \Rightarrow 3\sin^2 x = 11\cos x+\cos^2 x$ $\Rightarrow 3\left(1-\cos^2 x\right) = 11\cos x+\cos^2 x \Rightarrow 4\cos^2 x+11\cos x-3=0$	dM1, A1
	$\Rightarrow (4\cos x-1)(\cos x+3)=0 \Rightarrow \cos x = \dfrac{1}{4} \Rightarrow x = 1.318, 4.965$	dM1 A1
		(5)
(ii)	$\cos\theta = \dfrac{1}{3} \Rightarrow \sin^2\theta = 1-\dfrac{1}{3^2} \Rightarrow \tan\theta = \dfrac{\sin\theta}{\cos\theta} = \dfrac{\sqrt{1-\dfrac{1}{3^2}}}{\dfrac{1}{3}}$	M1
	$\Rightarrow \tan\theta = 2\sqrt{2}$	A1
		(2)
		Total 7

Question Number	Scheme	Marks
6(a)	States or uses $M=(5,4)$ **or** grad $AB = \dfrac{1}{3}$ o.e.	B1
	States or uses $M=(5,4)$ **and** grad $AB = \dfrac{1}{3}$ o.e.	B1
	Equation of l is $y-4=-3(x-5)$	M1
	$y=-3x+19$	A1
		(4)
(b)	$k=-2$	B1 ft
		(1)
(c)	Attempts radius or radius^2 E.g. $(11-7)^2+(6--2)^2$	M1
	States $(x-7)^2+(y+'2')^2=(11-7)^2+(6--2)^2$	dM1
	$(x-7)^2+(y+2)^2=80$	A1
		(3)
		(8 marks)

Question	Answer	Marks	Guidance
7(a)	Differentiate y^3 to obtain $3y^2\frac{dy}{dx}$	**B1**	
	Differentiate complete equation to produce at least one term involving $\frac{dy}{dx}$ using implicit differentiation.	**M1**	
	Obtain $2e^{2x}-18+3y^2\frac{dy}{dx}+\frac{dy}{dx}=0$	**A1**	
	Substitute $\frac{dy}{dx}=0$ to obtain either $p=\frac{1}{2}\ln 9$ or $p=\ln 3$	**A1**	
		4	
7(b)	Substitute value of p in original equation and rearrange as far as $y^3=\ldots$ or $q^3=\ldots$	**M1**	Allow in terms of $\ln 9$.
	Obtain given result $q=\sqrt[3]{2+18\ln 3-q}$ **or** $y=\sqrt[3]{2+18\ln 3-y}$ with sufficient detail	**A1**	AG
		2	
7(c)	Consider sign of $q-\sqrt[3]{2+18\ln 3-q}$ or equivalent for 2.5 and 3.0	**M1**	
	Obtain $-0.18\ldots$ and $0.34\ldots$ with sufficient detail and justify conclusion	**A1**	OE
		2	

Question Number	Scheme	Marks
	$x^2+y^2+6x-4y-14=0$	
6.(a)	Attempts $(x\pm3)^2+(y\pm2)^2.....(=0)$	M1
	(i) Centre $(-3,2)$	A1
	(ii) Radius $\sqrt{27}$ or $3\sqrt{3}$	A1
		(3)
(b)	 Attempts $y/k="2"\pm"3\sqrt{3}"$	M1
	Both $k=2+3\sqrt{3}$ and $k=2-3\sqrt{3}$	A1
		(2)
	Alt:	
	$y=k\Rightarrow x^2+6x+k^2-4k-14=0$	
	$\Rightarrow b^2-4ac=0\Rightarrow 6^2-4\times1\times\left(k^2-4k-14\right)=0$	
	$\Rightarrow 4k^2-16k-92=0\Rightarrow k=...$	M1
	$k=2\pm3\sqrt{3}$ (oe)	A1
		(2)
(c)	 Attempts Pythagoras to find h $h^2=r^2-2^2$	M1
	Attempts $p=2-h$	dM1
	$p=2-\sqrt{23}$ (oe)	A1
		(3)
	Alt1: chord touches circle when $x=-1$ (or -5) or need $(x+3)=\pm2$	M1
	$\Rightarrow 2^2+(y-2)^2=27\Rightarrow y=...$ or $(-1)^2+y^2+6(-1)-4y-14=0\Rightarrow y=...$	dM1
	$p=2-\sqrt{23}$	A1
		(3)
	Alt2: Sets $y=p$ and applies difference of roots to be 4	
	$\Rightarrow x^2+6x+p^2-4p-14=0\Rightarrow x=\dfrac{-6\pm\sqrt{36-4(p^2-4p-14)}}{2}$	M1
	$\Rightarrow 2\sqrt{23+4p-p^2}=4$	dM1
	$\Rightarrow p^2-4p-19=0\Rightarrow p=...$	A1
	$p=2-\sqrt{23}$	**(3)**
		(8 marks)