1	$3\tan^2\theta+7\sec\theta-3=0\Rightarrow 3\left(\sec^2\theta-1\right)+7\sec\theta-3=0$	M1
	$3\sec^2\theta+7\sec\theta-6=0$	A1
	$(3\sec\theta-2)(\sec\theta+3)=0\Rightarrow\sec\theta=...\Rightarrow\cos\theta=...$	dM1
	$\theta=109.5°, 250.5°$	A1, A1
		(5)

7 (a)	$\sin 4\theta\equiv 2\sin 2\theta\cos 2\theta$	M1
	$\equiv 2(2\sin\theta\cos\theta)\left(1-2\sin^2\theta\right)$	dM1
	$\equiv 4\sin\theta\cos\theta-8\sin^3\theta\cos\theta$	
	$\equiv\sin\theta\cos\theta\left(4-8\sin^2\theta\right)$	A1
		(3)
(b)	$\sec x\sin 4x=5\sin^3 x\cot x$	
	$\frac{1}{\cos x}\times\cos x\sin x\left(4-8\sin^2 x\right)=5\sin^3 x\cot x$	B1
	$\div\sin x\Rightarrow\ 4-8\sin^2 x=5\sin^2 x\cot x$	
	$\div\cos^2 x\Rightarrow\ 4\sec^2 x-8\tan^2 x=5\tan^2 x\cot x$	M1
	$\Rightarrow 4\sec^2 x-5\tan x-8\tan^2 x=0$ *	A1*
		(3)
(c)	Uses $\sec^2 x=1+\tan^2 x$	M1
	$\Rightarrow 4\tan^2 x+5\tan x-4=0$	A1
	$\Rightarrow\tan x=\frac{-5\pm\sqrt{89}}{8}\Rightarrow x=...$	dM1
	$\Rightarrow x=$ awrt 0.506, 2.08	A1
		(4)
		(10 marks)

	$f(x)=8\sin x\cos x+4\cos^2 x-3$	
4(a)	States or uses $\sin 2x=2\sin x\cos x$ or $\cos 2x=\pm 2\cos^2 x\pm 1$	M1
	Uses $\sin 2x=2\sin x\cos x$ and $\cos 2x=\pm 2\cos^2 x\pm 1$ in f (x)	dM1
	$\left(f(x)=\right)\ 8\sin x\cos x+4\cos^2 x-3=4\sin 2x+2\cos 2x-1$	A1
		(3)
(b)	$R^2=a^2+b^2\Rightarrow R=\sqrt{20}$ or $2\sqrt{5}$	B1ft
	$\tan\alpha=\frac{b}{a}\Rightarrow\alpha=...\ \left(="\text{awrt } 0.464"\right)$	M1
	$\left(f(x)=\right)\ 2\sqrt{5}\sin\left(2x+0.464\right)-1$	A1
		(3)
(c)	(i) Maximum value = $"2\sqrt{5}-1"$	B1 ft
	(ii) Solves $2x+\alpha=\frac{5\pi}{2}\Rightarrow x=...$	M1
	$\left(x=\right)$ awrt 3.69 (or $\left(x=\right)$ awrt 3.70)	A1
		(3)
		(9 marks)

Question Number	Scheme	Marks
5(a) Way One	$\cot^2 x - \tan^2 x \equiv \frac{\cos^2 x}{\sin^2 x} - \frac{\sin^2 x}{\cos^2 x} \equiv \frac{\cos^4 x - \sin^4 x}{\sin^2 x \cos^2 x}$	M1
	$\equiv \frac{(\cos^2 x - \sin^2 x)(\cos^2 x + \sin^2 x)}{\sin^2 x \cos^2 x} \equiv \frac{\cos 2x}{\ldots}$ or $\frac{\ldots}{\left(\frac{1}{2}\sin 2x\right)^2}$	dM1
	$\equiv \frac{\cos 2x}{\left(\frac{1}{2}\sin 2x\right)^2}$	A1
	$\equiv 4\frac{\cos 2x}{\sin 2x \sin 2x} \equiv 4\cot 2x \operatorname{cosec} 2x$ *	A1*
		(4)
(b)	$4\cot 2\theta \operatorname{cosec} 2\theta = 2\tan^2\theta \Rightarrow \cot^2\theta - \tan^2\theta = 2\tan^2\theta \Rightarrow \cot^2\theta - 3\tan^2\theta = 0$	M1
	$\cot^2\theta - 3\tan^2\theta = 0 \Rightarrow \frac{1}{\tan^2\theta} - 3\tan^2\theta = 0 \Rightarrow \tan^4\theta = \frac{1}{3}$	A1
	$\tan^4\theta = "\frac{1}{3}" \Rightarrow \tan\theta = \pm\sqrt[4]{"\frac{1}{3}"} = "\pm 0.7598.." \Rightarrow \theta = \ldots$	M1
	$\theta =$ awrt $0.65, \ -0.65$	A1A1
		(5)
		Total 9

8(a)	$\tan 3x \equiv \tan(2x+x) \equiv \frac{\tan 2x + \tan x}{1 - \tan 2x \tan x}$ or e.g. $\tan 3x \equiv \frac{\sin 3x}{\cos 3x} \equiv \frac{\sin(2x+x)}{\cos(2x+x)} \equiv \frac{\sin 2x\cos x + \cos 2x \sin x}{\cos 2x \cos x - \sin 2x \sin x} \equiv \frac{\tan 2x + \tan x}{1 - \tan 2x \tan x}$	M1
	$\frac{\tan 2x + \tan x}{1 - \tan 2x \tan x} \equiv \frac{\frac{2\tan x}{1-\tan^2 x} + \tan x}{1 - \frac{2\tan x}{1-\tan^2 x}\tan x}$	dM1
	$\frac{\frac{2\tan x}{1-\tan^2 x} + \tan x}{1 - \frac{2\tan x}{1-\tan^2 x}\tan x} \equiv \frac{2\tan x + \tan x - \tan^3 x}{1 - \tan^2 x - 2\tan^2 x}$ $\frac{3\tan x - \tan^3 x}{1 - 3\tan^2 x}$ *	A1*
		(3)

(b)	$\dfrac{3\tan\theta-\tan^3\theta}{1-3\tan^2\theta}=2\sec^2 3\theta-8\Rightarrow\tan 3\theta=2\sec^2 3\theta-8$ $\Rightarrow\tan 3\theta=2\left(1+\tan^2 3\theta\right)-8$	M1
	$\Rightarrow 2\tan^2 3\theta-\tan 3\theta-6=0$ or e.g. $\Rightarrow 2\tan^2 3\theta-\tan 3\theta=6$	A1
	$\left(2\tan 3\theta+3\right)\left(\tan 3\theta-2\right)=0\Rightarrow\tan 3\theta=-\dfrac{3}{2},\ 2$ $\tan 3\theta=-\dfrac{3}{2}\Rightarrow 3\theta=\ldots\Rightarrow\theta=\ldots$ or $\tan 3\theta=2\Rightarrow 3\theta=\ldots\Rightarrow\theta=\ldots$	dM1
	$\theta=0.37,\ 0.72,\ 1.42$	A1A1
		(5)
		Total 8

5 (i)	States $x=2$	B1
	$\sqrt{3}\sec x+2=0\Rightarrow\cos x=-\dfrac{\sqrt{3}}{2}\Rightarrow x=\ldots$	M1
	$x=\dfrac{5\pi}{6}$	A1
		(3)
(ii)	Attempts to use $\cos 2\theta=1-2\sin^2\theta$	M1
	$6\sin^2\theta+10\sin\theta-3=0$	A1
	$\sin\theta=\dfrac{-5\pm\sqrt{43}}{6}\left(=-1.926\ldots,0.2595\ldots\right)\Rightarrow\theta=\arcsin(\ldots)$	M1
	$\theta=15.0°,\ 165°$	A1
		(4)
		(7 marks)