6 (a)	$y=\frac{4x+3}{x-2} \Rightarrow yx-2y=4x+3$ $\Rightarrow yx-4x=2y+3$	$y=4+\frac{11}{x-2} \Rightarrow y-4=\frac{11}{x-2}$ $x-2=\frac{11}{y-4}$	M1
	$\Rightarrow x=\frac{2y+3}{y-4} \Rightarrow f^{-1}(x)=\frac{2x+3}{x-4}$	$\Rightarrow x=2+\frac{11}{y-4} \Rightarrow f^{-1}(x)=2+\frac{11}{x-4}$	A1
	$x \neq 4$		B1 **(3)**
(b)	$ff(x)=\frac{4\times\frac{4x+3}{x-2}+3}{\frac{4x+3}{x-2}-2}$ or $ff(x)=4+\frac{11}{4+\frac{11}{x-2}-2}$		M1
	$=\frac{4\times(4x+3)+3(x-2)}{4x+3-2(x-2)}=\frac{19x+6}{2x+7}$		dM1 A1 **(3)**
(c)	Either $x=1$ or $y=38$ $(1, 38)$		M1 A1 **(2)** **(8 marks)**

(c)	$g^{-1}(x)=e^{\frac{x-3}{2}}$	M1A1
	$x \ldots 3$	B1
		(3)
(d)	$g\left(\frac{2a}{3a-5}\right)=5 \Rightarrow 3+2\ln\left(\frac{2a}{3a-5}\right)=5$	B1
	$\ln\left(\frac{2a}{3a-5}\right)=1 \Rightarrow \frac{2a}{3a-5}=e$	M1
	$\frac{2a}{3a-5}=e \Rightarrow a=\ldots$	**d**M1
	$a=\frac{5e}{3e-2}$	A1
		(4)

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

Question Number	Scheme	Marks
1(a)	$(-2, -3)$	B1
		(1)
(b)	$(-3, -9)$	B1B1
		(2)
(c)	$(-4, 3)$	B1
		(1)
		(4 marks)

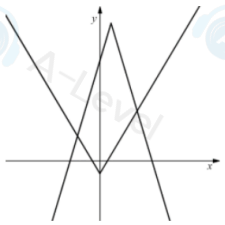
Question Number	Scheme	Marks
1(a)	$\text{gf}(1) = \text{g}\left(\frac{2(1)}{3\times 1+1}\right) = 4 - \left(\frac{2(1)}{3\times 1+1}\right)^2$	M1
	$= \frac{15}{4}$ oe	A1
		(2)
(b)	$\text{f}(x) \ldots 0$ or $\text{f}(x) < \frac{2}{3}$	B1
	$0 \,,,\ \text{f}(x) < \frac{2}{3}$	B1
		(2)

(c)	$y=\frac{2x}{3x+1}\Rightarrow 3xy+y=2x\Rightarrow 3xy-2x=-y\Rightarrow x(3y-2)=-y$ or $x=\frac{2y}{3y+1}\Rightarrow 3xy+x=2y\Rightarrow 3xy-2y=-x\Rightarrow y(3x-2)=-x$	M1
	$\Rightarrow f^{-1}(x)=\frac{x}{2-3x}$	A1
		(2)
(d)	$f^{-1}(x)=f(x)$ **or** $f^{-1}(x)=x$ **or** $f(x)=x$ $"\frac{x}{2-3x}"=\frac{2x}{3x+1}$ **or** $"\frac{x}{2-3x}"=x$ **or** $\frac{2x}{3x+1}=x$ $\Rightarrow x(3x+1)=2x(2-3x)$ **or** $x=x(2-3x)$ **or** $2x=x(3x+1)$ $\Rightarrow x=...$	M1
	$x=0,\frac{1}{3}$	A1
		(2)
		Total 8

Question Number	Scheme	Marks
8 (i)	States or uses $\text{cosec}\,\theta=\frac{1}{\sin\theta}$	B1
	Uses both $\text{cosec}\,\theta=\frac{1}{\sin\theta}$ and $\sin 2\theta=2\sin\theta\cos\theta$	M1
	$3\text{cosec}\,\theta=8\cos\theta\Rightarrow\sin 2\theta=\frac{3}{4}$	A1
	$\Rightarrow\theta=\frac{1}{2}\arcsin\left(\frac{3}{4}\right)=$ awrt 0.424, awrt 1.15	M1 A1
		(5)
(ii)	$\frac{\tan 2x-\tan 70°}{1+\tan 2x\tan 70°}=-\frac{3}{8}\Rightarrow\tan(2x-70°)=-\frac{3}{8}$	M1 A1
	Correct order of operations $x=\frac{\arctan\left(-\frac{3}{8}\right)+70°}{2}$	dM1
	awrt 24.7° , awrt 114.7°	A1
		(4)
		(9 marks)

8(a)	Starting with the LHS: $2\text{cosec}^2 2\theta(1-\cos 2\theta)=\frac{2-2\cos 2\theta}{\sin^2 2\theta}$	M1
	$=\frac{2-2(1-2\sin^2\theta)}{4\sin^2\theta\cos^2\theta}$	M1dM1
	$=\sec^2\theta=1+\tan^2\theta\equiv$ RHS *	A1*
		(4)
(b)	$\sec^2 x-3\sec x-4=0\Rightarrow\sec x=...$	M1
	$\cos x=\frac{1}{4}$ (ignore -1)	A1
	$\cos x=\frac{1}{4}\Rightarrow x=...$	dM1
	$x=75.5°,\ 284.5°$	A1
		(4)
		(8 marks)

Question Number	Scheme	Marks
8(a)(i)	$\left(\frac{b}{2}, a\right)$	B1B1
(ii)	$(0,\ a-b)$	B1
(iii)	$\left(\frac{b-a}{2}, 0\right)$ and $\left(\frac{a+b}{2}, 0\right)$	B1B1
		(5)

(b)		B1B1
		(2)
(c)	$-x-1=2x+a-b,\ x=-3 \Rightarrow 2=-6+a-b$ or $x-1=a+b-2x,\ x=5 \Rightarrow 5-1=a+b-10$	M1
	$-x-1=2x+a-b,\ x=-3 \Rightarrow 2=-6+a-b$ and $x-1=a+b-2x,\ x=5 \Rightarrow 5-1=a+b-10$	dM1 (A1 on ePEN)
	$\begin{matrix} a-b=8 \\ a+b=14 \end{matrix} \Rightarrow a=\ldots$ or $b=\ldots$	**dd**M1
	$a=11,\ b=3$	A1
		(4)
		(11 marks)

Question Number	Scheme	Marks
1(a)	$f(x)$ „ 9	B1
		(1)
(b)	$fg(1.5)=f\left(\frac{3}{2\times1.5+1}\right)=9-\left(\frac{3}{2\times1.5+1}\right)^2$	M1
	$=\frac{135}{16}$	A1
		(2)
(c)	$g(x)=\frac{3}{2x+1} \Rightarrow g^{-1}(x)=\frac{3-x}{2x}$	M1 A1
	$0<x$ „ 3	B1
		(3)
		Total 6

4.(a)	$x^2+0x+1\overline{)3x^3-5x^2+7x-5}$ $\quad 3x-5$ $3x^3+0x^2+3x$ $-5x^2+4x$ $-5x^2+0x-5$ $4x$	M1
	$A=3, \quad B=-5, C=4$	B1, A1
	$D=0$ *	A1*
		(4)
(b)	$\int 3x-5+\frac{4x}{x^2+1}\,\mathrm{d}x=\frac{3x^2}{2}-5x+2\ln(x^2+1)+c$	M1, A1ft
	$\text{Area}=\left(\frac{3\times3^2}{2}-5\times3+2\ln(3^2+1)\right)-\left(\frac{3\times2^2}{2}-5\times2+2\ln(2^2+1)\right)$ $=\frac{5}{2}+\ln 4$	dM1, A1
		(4) **(8 marks)**