Question	Scheme	Marks
11(a)	$x=\frac{5\pi}{2}$ **or** $y=12$	B1
	$x=\frac{5\pi}{2}$ **and** $y=12$	B1
		(2)
(b)	$x=\frac{3\pi}{2}$ **or** $y=-21$	B1
	$x=\frac{3\pi}{2}$ **and** $y=-21$	B1
		(2)
(c)(i)	$(A=)-12$	B1
(ii)	$(B=)\frac{5\pi}{4}$	B1
		(2)
		Total 6

Question	Answer	Marks	Guidance
11(b)	$g^{-1}(x)=\frac{1}{4}(x-k)$	**B1**	
	$g^{-1}f(x)=\frac{1}{4}(10+6x-x^2-k)=4x+k$	**M1**	OE May use *their* completed square form for f(x).
	Simplify the quadratic equation obtained from $g^{-1}f(x)=g(x)$ provided k is present and apply $b^2-4ac=0$ to this quadratic equation	***M1**	Expect $x^2+10x-10+5k=0$.
	Obtain $100-4(5k-10)=0$ and hence $k=7$	**A1**	
	Use *their* k to form and solve a quadratic in x	**DM1**	Allow if *their* quadratic has two solutions.
	$(-5,-13)$ only	**A1**	**SC B1** if no method seen.
	Alternative Method for first 4 marks		
	State $f(x)=gg(x)$	**(B1)**	
	$gg(x)=16x+5k$	**(M1)**	
	Apply $b^2-4ac=0$ to quadratic equation obtained from $f(x)=gg(x)$	**(*M1)**	Provided k is present.
	$100-4(5k-10)=0$ and hence $k=7$	**(A1)**	
		6	

Question	Answer	Marks	Guidance
6	$cx^2+2x-3=6x-c$ leading to $cx^2-4x+(c-3)\,[=0]$	B1	3-term quadratic.
	$16-4c(c-3)=0$	*M1	Apply $b^2-4ac=0$ ('= 0' may be implied in subsequent work). *Their* coefficients must be substituted correctly
	$4c^2-12c-16[=0]$ leading to $[4](c-4)(c+1)\,[=0]$ leading to $c=4$ and -1	A1	Dependent on factorisation oe.
	When $c=4$, $4x^2-4x+1[=0]$ $\left[(2x-1)^2=0\right]$	DM1	OE. Substituting *their* $c=4$ into *their* quadratic equation.
	$x=\frac{1}{2}$, $y=-1$	A1	Both required.
	When $c=-1$, $x^2+4x+4[=0]$ $\left[(x+2)^2=0\right]$	DM1	OE. Substituting *their* $c=$ -1 into *their* quadratic equation.
	$x=-2$, $y=-11$	A1	Both required.
	Alternative method for Question 6		
	$\frac{dy}{dx}=2cx+2$	B1	
	$2cx+2=6$	M1	Equating *their* curve gradient and 6.
	$c=\frac{2}{x}$	A1	SOI
	$2x^2+3x-2\,[=0]$	DM1	Substitute $c=\frac{2}{x}$ into $cx^2+2x-3=6x-c$. Simplify to 3-term quadratic.

Question	Answer	Marks	Guidance
1	{Reflection} {[in the] x-axis} or {Stretch of scale factor -1} {parallel to y-axis}	*B1 DB1	{} indicate how the B1 marks should be awarded throughout.
	Then {Translation} $\left\{\begin{pmatrix}0\\3\end{pmatrix}\right\}$	B1 B1	Or Translation 3 units in the positive y-direction. **N.B.** If order reversed a maximum of 3 out of 4 marks awarded.
	Alternative method for question 1		
	{Translation} $\left\{\begin{pmatrix}0\\-3\end{pmatrix}\right\}$	B1 B1	Or Translation 3 units in the negative y-direction.
	Then {Reflection} {in the x-axis} or {Stretch of scale factor -1} {parallel to y-axis}	*B1 DB1	**N.B.** If order reversed a maximum of 3 out of 4 marks awarded.
		4	

Question	Answer	Marks	Guidance
8(a)	$[fg(x)=]1/(2x+1)^2-1$	B1	SOI
	$1/(2x+1)^2-1=3$ leading to $4(2x+1)^2=1$ or $\frac{1}{(2x+1)}=[\pm]2$ or $16x^2+16x+3=0$	M1	Setting $fg(x)=3$ and reaching a stage before $2x+1=\pm½$ or reaching a 3 term quadratic in x
	$2x+1=\pm½$ or $2x+1=-½$ or $(4x+1)(4x+3)[=0]$	A1	Or formula or completing square on quadratic
	$x=-\frac{3}{4}$ only	A1	
	Alternative method for Question 8(a)		
	$x^2-1=3$	M1	
	$g(x)=-2$	A1	
	$\frac{1}{(2x+1)}=-2$	M1	
	$x=-\frac{3}{4}$ only	A1	
		4	

Question	Answer	Marks	Guidance
8(b)	$y=\frac{1}{(2x+1)^2}-1$ leading to $(2x+1)^2=\frac{1}{y+1}$ leading to $2x+1=[\pm]\frac{1}{\sqrt{y+1}}$	*M1	Obtain $2x+1$ or $2y+1$ as the subject
	$x=[\pm]\frac{1}{2\sqrt{y+1}}-\frac{1}{2}$	DM1	Make x (or y) the subject
	$-\frac{1}{2\sqrt{x+1}}-\frac{1}{2}$	A1	OE e.g. $-\frac{\sqrt{x+1}}{2x+2}-\frac{1}{2}$, $-\left(\sqrt{\frac{-x}{4x+4}}+\frac{1}{4}+\frac{1}{2}\right)$
		3	

Question	Answer	Marks	Guidance
11(a)	$(5-2p)^2+(p+2)^2=(10-2p)^2+(3-p)^2$	M1 A1	Allow one sign error for M mark only.
	$25-20p+4p^2+p^2+4p+4=100-40p+4p^2+9-6p+p^2$ $30p=80 \rightarrow p=\frac{8}{3}$ oe	A1	Allow 2.67 AWRT.
		3	

Question	Answer	Marks	Guidance
11(b)(i)	$m_{AC}=\frac{p+2}{2p-5}$ $m_{BC}=\frac{p-3}{2p-10}$	M1	Allow a sign error.
	$\frac{p+2}{2p-5}\times\frac{p-3}{2p-10}=-1$	M1	Use of $m_1m_2=-1$ with their m_{AC} and m_{BC}.
	$p^2-p-6=-(4p^2-30p+50) \rightarrow 5p^2-31p+44\ (=0)$	A1	
	$p=4$ (Ignore $p=\frac{11}{5}$)	A1	Factors $(p-4)(5p-11)$, or formula or completing square must be seen.
		4	
11(b)(ii)	Mid-point of $AB=(7½, ½)$	B1	SOI
	$r^2=2½^2+2½^2$ $\left[=\frac{50}{4}\right]$ or $r=\sqrt{(2½^2+2½^2)}$ $\left[=\frac{5\sqrt{2}}{2}\right]$	*M1	Or $r^2=\frac{1}{4}(5^2+5^2)$ $\left[=\frac{50}{4}\right]$ etc.
	Equation of circle is $(x-their7½)^2+(y-their½)^2=their\frac{50}{4}$	DM1	Must use r^2 not r or d or d^2
	$x^2+y^2-15x-y+44=0$	A1	CAO
		4	

Question	Answer	Marks	Guidance
1	{Translation} $\begin{pmatrix}\{0\}\\\{-2\}\end{pmatrix}$	B2, 1, 0	B2 for fully correct, B1 with two elements correct. {} indicates different elements.
	{Stretch} {[scale] factor 2} {parallel to x-axis}	B2, 1, 0	B2 for fully correct, B1 with two elements correct.
		4	Transformations can be in either order.

Question	Answer	Marks
1	$3x^2+2x+4=mx+1 \rightarrow 3x^2+x(2-m)+3\ (=0)$	B1
	$(2-m)^2-36$ SOI	M1
	$(m+4)(m-8)$ (>/= 0) **or** $2-m$ >/= 6 and $2-m$ </= –6 OE	A1
	$m<-4$, $m>8$ WWW	A1
	Alternative method for question 1	
	$\frac{dy}{dx}=6x+2 \rightarrow m=6x+2 \rightarrow 3x^2+2x+4=(6x+2)x+1$	M1
	$x=\pm 1$	A1
	$m=\pm 6+2 \rightarrow m=8$ or -4	A1
	$m<-4$, $m>8$ WWW	A1
		4