Question	Answer	Marks	Partial marks
1	−0.8, 0.55, 2.25	**B1**	
	$x < -0.8$ $0.55 < x < 2.25$	**B2**	**B1** for either inequality correct
2(a)	$5 - (x + 2)^2$	**B2**	**B1** for $-(x + 2)^2$ or $(x + 2)^2$ or $a = 5$ and $b = 2$
2(b)	$f \leqslant 5$ or $f(x) \leqslant 5$	**B1**	**FT** *their* 5
2(c)	−2	**B1**	**FT** − *their* 2
2(d)	Complete method to find inverse function: Swaps the variables and rearranges or rearranges and swaps the variables at some point in their solution	**M1**	For **M1 FT** *their* part (a) provided it is in the form $a-(x+b)^2$
	$[g^{-1}(x) =] - 2 + \sqrt{5-x}$ or $\left[g^{-1}(x) = \right]\dfrac{-4+\sqrt{4^2-4[1](x-1)}}{2}$ or $\left[g^{-1}(x) = \right]\dfrac{-(-4)-\sqrt{(-4)^2-4(-1)(1-x)}}{-2}$ oe, isw	**A2**	**A1** for $[g^{-1}(x) =] - 2 \pm \sqrt{5-x}$ or $[g^{-1}(x) =] = \dfrac{-4 \pm \sqrt{4^2-4[1](x-1)}}{2(1)}$ or $[g^{-1}(x) =] = \dfrac{-(-4) \pm \sqrt{4^2-4(-1)(1-x)}}{2(-1)}$
	[Domain:] $x \leqslant 5$	**B1**	**FT** *their* part (b) provided it is in form $f(x) \leqslant a$ where a is a constant
	[Range:] $g^{-1} \geqslant$ *their* −2	**B1**	**FT** *their* value of k in part (c)
3(a)	$4\tan^2\theta - \sec^2\theta$	**M1**	e.g. $4\dfrac{\sin^2\theta}{\cos^2\theta} - \dfrac{1}{\cos^2\theta}$
	Justified completion to given answer e.g. $4\tan^2\theta - (1 + \tan^2\theta)$ $= 3\tan^2\theta - 1$ or $3\tan^2\theta - (\sec^2\theta - \tan^2\theta)$ $= 3\tan^2\theta - 1$	**A1**	e.g. $4\dfrac{\sin^2\theta}{\cos^2\theta} - \dfrac{\sin^2\theta + \cos^2\theta}{\cos^2\theta}$ $= 4\tan^2\theta - \tan^2\theta - 1$ $= 3\tan^2\theta - 1$
3(b)	$\tan\theta = [\pm]\sqrt{\dfrac{2}{3}}$ oe	**M2**	**M1** for $\tan^2\theta = \dfrac{2}{3}$ oe
	$[\theta =]$ 39.2 or 39.23 to 39.232 $[\theta =]$ 140.8 or 140.76 to 140.77 and no extras in range	**A2**	**A1** for either one correct, ignoring extras

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Question	Answer	Marks	Partial marks
4(a)	Correct statement for area e.g. $\frac{1}{2}r^2\alpha = 9$ or $\frac{1}{2}rs = 9$	**B1**	
	Finds an equation that can be used to eliminate α or s e.g. $\alpha = \frac{18}{r^2}$ or $r\alpha = \frac{18}{r}$ or $s = \frac{18}{r}$	**M1**	
	Correct substitution and completion to given answer e.g. $P = 2r + r \times \frac{18}{r^2} = 2r + \frac{18}{r}$	**A1**	
4(b)	Correct derivative: $2 - \frac{18}{r^2}$ oe isw	**B1**	
	$2 - \frac{18}{r^2} = 0$ and solves for r	**M1**	**FT** *their* $\frac{\mathrm{d}P}{\mathrm{d}r} = 0$ providing of the form $2 + \frac{n}{r^k}$ where n and k are non-zero integers
	$r = 3$ only soi	**A1**	
	$P = 12$ only soi	**A1**	
	[2nd derivative =] $\frac{36}{r^3}$ oe **and** which is positive for $r = 3$ →minimum **or** as $r > 0$ [2nd derivative =] > 0 →minimum **or** [2nd derivative =] $\frac{36}{3^3}$ oe →minimum OR correctly finds the values of the first derivative at $3 \pm h$ where h is small → minimum	**A1**	**dep** on $r = 3$ and no other value