

Question	Scheme	Marks	AOs
<b>6 (a)</b>	$gg(0) = g((0-2)^2+1) = g(5) = 4(5) - 7 = 13$	M1	2.1
		A1	1.1b
		<b>(2)</b>	
<b>(b)</b>	Solves either $(x-2)^2+1=28 \Rightarrow x=...$ or $4x-7=28 \Rightarrow x=...$	M1	1.1b
	At least one critical value $x=2-3\sqrt{3}$ or $x=\frac{35}{4}$ is correct	A1	1.1b
	Solves both $(x-2)^2+1=28 \Rightarrow x=...$ and $4x-7=28 \Rightarrow x=...$	M1	1.1b
	Correct final answer of ' $x < 2-3\sqrt{3}$ , $x > \frac{35}{4}$ '	A1	2.1
	<b>Note:</b> Writing awrt $-3.20$ or a truncated $-3.19$ or a truncated $-3.2$ in place of $2-3\sqrt{3}$ is accepted for any of the A marks	<b>(4)</b>	
<b>(c)</b>	<u>h</u> is a <u>one-one</u> {function (or mapping) so has an inverse}	B1	2.4
	<u>g</u> is a <u>many-one</u> {function (or mapping) so does not have an inverse}		
		<b>(1)</b>	
<b>(d)</b> <b>Way 1</b>	$\left\{ h^{-1}(x) = -\frac{1}{2} \Rightarrow \right\} x = h\left(-\frac{1}{2}\right)$	M1 B1 on open	1.1b
	$x = \left(-\frac{1}{2} - 2\right)^2 + 1$ <b>Note:</b> Condone $x = \left(\frac{1}{2} - 2\right)^2 + 1$	M1	1.1b
	$\Rightarrow x = 7.25$ only <b>cso</b>	A1	2.2a
		<b>(3)</b>	
<b>(d)</b> <b>Way 2</b>	{their $h^{-1}(x)$ } = $\pm 2 \pm \sqrt{x+1}$	M1	1.1b
	Attempts to solve $\pm 2 \pm \sqrt{x+1} = -\frac{1}{2} \Rightarrow \pm \sqrt{x+1} = ...$	M1	1.1b
	$\Rightarrow x = 7.25$ only <b>cso</b>	A1	2.2a
		<b>(3)</b>	

**(10 marks)**

Notes for Question 6

<b>(a)</b>	
<b>M1:</b>	Uses a complete method to find $gg(0)$ . E.g. <ul style="list-style-type: none"> <li>Substituting <math>x=0</math> into <math>(0-2)^2+1</math> and the result of this into the relevant part of <math>g(x)</math></li> <li>Attempts to substitute <math>x=0</math> into <math>4((x-2)^2+1) - 7</math> or <math>4(x-2)^2 - 3</math></li> </ul>
<b>A1:</b>	$gg(0) = 13$
<b>(b)</b>	
<b>M1:</b>	See scheme
<b>A1:</b>	See scheme
<b>M1:</b>	See scheme
<b>A1:</b>	Brings all the strands of the problem together to give a correct solution.
<b>Note:</b>	You can ignore inequality symbols for any of the M marks
<b>Note:</b>	If a 3TQ is formed (e.g. $x^2 - 4x - 23 = 0$ ) then a correct method for solving a 3TQ is required for the relevant method mark to be given.
<b>Note:</b>	Writing $(x-2)^2+1=28 \Rightarrow (x-2)+1 = \sqrt{28} \Rightarrow x = -1 + \sqrt{28}$ (i.e. taking the square-root of each term to solve $(x-2)^2+1=28$ is not considered to be an acceptable method)
<b>Note:</b>	Allow set notation. E.g. $\{x \in \mathbb{R} : x < 2-3\sqrt{3} \cup x > 8.75\}$ is fine for the final A mark

## Notes for Question 6 Continued

<b>(b)</b>	<i>continued</i>
<b>Note:</b>	Give final A0 for $\{x \in \mathbb{R} : x < 2 - 3\sqrt{3} \cap x > 8.75\}$
<b>Note:</b>	Give final A0 for $2 - 3\sqrt{3} > x > 8.75$
<b>Note:</b>	Allow final A1 for their writing a final answer of “ $x < 2 - 3\sqrt{3}$ and $x > \frac{35}{4}$ ”

<b>Note:</b>	Allow final A1 for a final answer of $x < 2 - 3\sqrt{3}, x > \frac{35}{4}$
<b>Note:</b>	Writing $2 - \sqrt{27}$ in place of $2 - 3\sqrt{3}$ is accepted for any of the A marks
<b>Note:</b>	Allow final A1 for a final answer of $x < -3.20, x > 8.75$
<b>Note:</b>	Using 29 instead of 28 is M0 A0 M0 A0

<b>(c)</b>	
<b>B1:</b>	A correct explanation that conveys the <u>underlined points</u>
<b>Note:</b>	A minimal acceptable reason is “h is a one-one and g is a many-one”
<b>Note:</b>	Give B1 for “ $h^{-1}$ is one-one and $g^{-1}$ is one-many”
<b>Note:</b>	Give B1 for “h is a one-one and g is not”
<b>Note:</b>	Allow B1 for “g is a many-one and h is not”

<b>(d)</b>	<b>Way 1</b>
<b>M1:</b>	Writes $x = h\left(-\frac{1}{2}\right)$
<b>M1:</b>	See scheme
<b>A1:</b>	Uses $x = h\left(-\frac{1}{2}\right)$ to deduce that $x = 7.25$ only, <b>cs0</b>

<b>(d)</b>	<b>Way 2</b>
<b>M1:</b>	See scheme
<b>M1:</b>	See scheme
<b>A1:</b>	Use a correct $h^{-1}(x) = 2 - \sqrt{x-1}$ to deduce that $x = 7.25$ only, <b>cs0</b>
<b>Note:</b>	Give final A0 cs0 for $2 + \sqrt{x-1} = -\frac{1}{2} \Rightarrow \sqrt{x-1} = -\frac{5}{2} \Rightarrow x-1 = \frac{25}{4} \Rightarrow x = 7.25$
<b>Note:</b>	Give final A0 cs0 for $2 \pm \sqrt{x-1} = -\frac{1}{2} \Rightarrow \sqrt{x-1} = -\frac{5}{2} \Rightarrow x-1 = \frac{25}{4} \Rightarrow x = 7.25$
<b>Note:</b>	Give final A1 cs0 for $2 \pm \sqrt{x-1} = -\frac{1}{2} \Rightarrow -\sqrt{x-1} = -\frac{5}{2} \Rightarrow x-1 = \frac{25}{4} \Rightarrow x = 7.25$
<b>Note:</b>	Allow final A1 for $2 \pm \sqrt{x-1} = -\frac{1}{2} \Rightarrow \pm \sqrt{x-1} = -\frac{5}{2} \Rightarrow x-1 = \frac{25}{4} \Rightarrow x = 7.25$