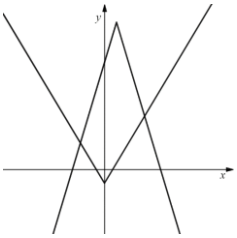
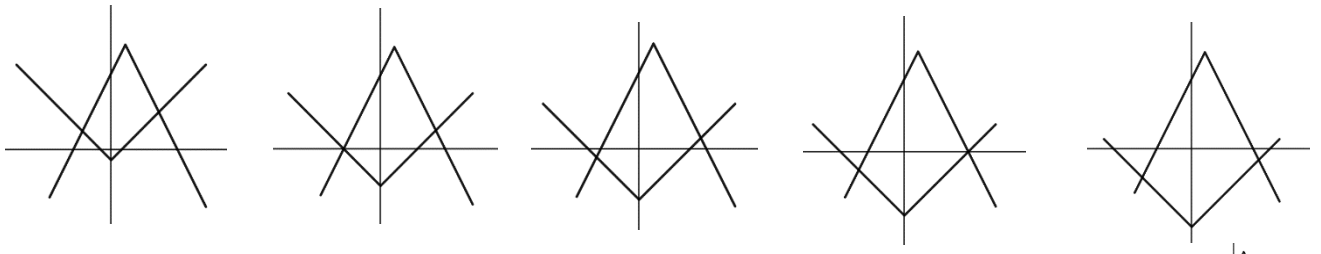
(b)		B1B1
		(2)
(c)	$-x-1=2x+a-b,\ x=-3\Rightarrow 2=-6+a-b$ or $x-1=a+b-2x,\ x=5\Rightarrow 5-1=a+b-10$	M1
	$-x-1=2x+a-b,\ x=-3\Rightarrow 2=-6+a-b$ and $x-1=a+b-2x,\ x=5\Rightarrow 5-1=a+b-10$	dM1 (A1 on ePEN)
	$\begin{matrix}a-b=8\\a+b=14\end{matrix}\Rightarrow a=...$ or $b=...$	**dd**M1
	$a=11,\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

(b)

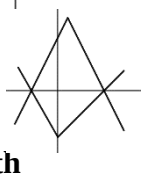
B1: A V shaped graph anywhere on the set of axes

B1: Correct shape with a minimum point on the *y*-axis below the *x*-axis and with an intention for the graph to be symmetrical about the *y*-axis. The left branch of $y=|x|-1$ must intersect the left branch of $y=a-|2x-b|$ and the right branch of $y=|x|-1$ must intersect the right branch of $y=a-|2x-b|$

These are all acceptable for both marks:



But the intersections of the branches must not both be on the *x*-axis e.g.



Some candidates may use Figure 2 to do their sketch which is acceptable but if both Diagram 1 and Figure 2 are used and neither is "rejected" then Diagram 1 takes precedence.

If they draw a sketch of $y=|x|-1$ on their own axes, only the first B mark is available unless they draw the given graph as well in which case the 2nd B is available.

(c) Note that $x = -3 \Rightarrow y = 2$ and $x = 5 \Rightarrow y = 4$ **and may be used to find the equations.**

M1: Forms one correct equation in *a* and *b* only with modulus signs removed, simplified or unsimplified. There may be several equations so you will need to check if any of them are correct.

dM1(A1 on ePEN):

Forms 2 correct equations in *a* and *b* only with modulus signs removed, simplified or unsimplified. There may be several equations so you will need to check if 2 of them are correct.

Note that for their second equation, some candidates may substitute in for *a* or *b* from their 1st equation but may make a slip when rearranging. Condone this if the 2nd equation is otherwise correct.

ddM1: Solves the correct equations in *a* and *b* e.g. $8 = a - b$ and $14 = a + b$ or equivalent to find a value for *a* or a value for *b*.

A1: $a = 11,\ b = 3$ (Correct answers with no working scores no marks)

Question Number	Scheme	Marks
9(a)	$\dfrac{3\sin\theta\cos\theta}{\cos\theta+\sin\theta}=(2+\sec 2\theta)(\cos\theta-\sin\theta)$ $\Rightarrow \dfrac{3}{2}\sin 2\theta=(2+\sec 2\theta)(\cos\theta-\sin\theta)\left(\cos\theta+\sin\theta\right)$ **or** $\Rightarrow 3\sin\theta\cos\theta=(2+\sec 2\theta)\cos 2\theta$	M1
	$\Rightarrow \dfrac{3}{2}\sin 2\theta=(2+\sec 2\theta)\cos 2\theta$	**d**M1
	$\Rightarrow \dfrac{3}{2}\sin 2\theta=(2+\sec 2\theta)\cos 2\theta$ $\Rightarrow \dfrac{3}{2}\sin 2\theta=2\cos 2\theta+1\Rightarrow 3\sin 2\theta-4\cos 2\theta=2$ *	A1*
		(3)

(a)

M1: Attempts to use $\sin 2\theta=2\sin\theta\cos\theta$ **or** $\cos 2\theta=\pm\cos^2\theta\pm\sin^2\theta$
Accept going from $(\cos\theta-\sin\theta)\left(\cos\theta+\sin\theta\right)$ to $\cos 2\theta$

dM1: Attempts to use $\sin 2\theta=2\sin\theta\cos\theta$ **and** $\cos 2\theta=\pm\cos^2\theta\pm\sin^2\theta$
Accept going from $(\cos\theta-\sin\theta)\left(\cos\theta+\sin\theta\right)$ to $\cos 2\theta$
Depends on the previous method mark.

A1*: Uses the identity $\sec 2\theta=\dfrac{1}{\cos 2\theta}$ to achieve an equation in just $\sin 2\theta$ and $\cos 2\theta$ and proceeds to the given answer with all previous stages of working seen.
Note we would accept going from e.g. $6\sin\theta\cos\theta=4\cos 2\theta+2$ to the given answer.

You can condone e.g. a missing θ or a missing bracket but withhold the A mark if there are clear errors such as a missing "2" or a missing pair of brackets that are not recovered.

There are various alternatives in part (b) and in each case:

- **the first 3 marks are for obtaining a suitable equation**
- **the final 2 marks are for solving their equation**

Condone the use of a variable other than *x* in (b) e.g. θ

(b)	Way 1 using $R\sin(2x-\alpha)$ or $R\cos(2x+\alpha)$	
	$\Rightarrow R=\sqrt{3^2+4^2}=...(5)$ **or** $(\alpha=)\ \tan^{-1}\left(\frac{4}{3}\text{ or }\frac{3}{4}\right)=...$	M1
	$\Rightarrow R=\sqrt{3^2+4^2}=...(5)$ **and** $(\alpha=)\ \tan^{-1}\left(\frac{4}{3}\text{ or }\frac{3}{4}\right)=...$	**d**M1
	$3\sin 2x-4\cos 2x=2\Rightarrow 5\sin(2x-0.927)=2$ **or** $3\sin 2x-4\cos 2x=2\Rightarrow 5\cos(2x+0.644)=-2$	A1
	$5\sin(2x-0.927)=2\Rightarrow x=\dfrac{\sin^{-1}\frac{2}{5}+0.927}{2}$ **or** $5\cos(2x+0.644)=-2\Rightarrow x=\dfrac{\cos^{-1}\frac{-2}{5}-0.644}{2}$	**dd**M1
	$x=$ awrt 3.81	A1
		(5)
		(8 marks)

Note that is it not necessary to state the form $R\sin(2x-\alpha)$ or $R\cos(2x+\alpha)$ for the first 2 marks

M1: $R=\sqrt{3^2+4^2}\ (=5)$ Condone obtaining ± 5

or $(\alpha=)\ \tan^{-1}\left(\pm\frac{4}{3}\right)$, $\tan^{-1}\left(\pm\frac{3}{4}\right)$, $\cos^{-1}\left(\pm\frac{3}{"5"}\right)$, $\sin^{-1}\left(\pm\frac{4}{"5"}\right)$, $\cos^{-1}\left(\pm\frac{4}{5}\right)$, $\sin^{-1}\left(\pm\frac{3}{5}\right)$

dM1: $R=\sqrt{3^2+4^2}\ (=5)$ Condone obtaining ± 5

and $(\alpha=)\ \tan^{-1}\left(\pm\frac{4}{3}\right)$, $\tan^{-1}\left(\pm\frac{3}{4}\right)$, $\cos^{-1}\left(\pm\frac{3}{"5"}\right)$, $\sin^{-1}\left(\pm\frac{4}{"5"}\right)$, $\cos^{-1}\left(\pm\frac{4}{5}\right)$, $\sin^{-1}\left(\pm\frac{3}{5}\right)$

Depends on the previous method mark.

A1: Correct equation: $5\sin(2x-0.927)=2$ **or** $5\cos(2x+0.644)=-2$ which may be implied.
Accept awrt 0.93 or 0.64 for "α".
Do not allow e.g. $\pm5\sin(2x-0.927)=2$ or $\pm5\cos(2x+0.644)=-2$ unless they recover by solving the correct equation.

ddM1: Attempts to solve their equation of the correct form e.g. with $(2x\pm\ldots)$ as the argument and proceeds to find a value for *x*.
The order of operations should be correct <u>for their equation</u> but condone $\pm"0.927"$ or $\pm"0.644"$

e.g. $x=\dfrac{\left(\sin^{-1}\left(\frac{2}{"5"}\right)\right)\pm"0.927"}{2}$ or $x=\dfrac{\cos^{-1}\frac{-2}{"5"}\pm0.644}{2}$