Question Number	Scheme	Marks
8	$x-6x^{\frac{1}{2}}+4=0$ $x^{\frac{1}{2}}=3\pm\sqrt{5}$ oe $x=\left(3\pm\sqrt{5}\right)^2 \Rightarrow x=14\pm6\sqrt{5}$	 M1 A1 M1 A1 A1 **(5 marks)**

M1 For attempting to solve an equation of the form $y^2-6y+4=0$ by completing the square or quadratic formula to reach at least one solution. There must be some working shown for this mark to be awarded, accept as a minimum identifying $y=x^{\frac{1}{2}}$ and writing the quadratic in y before solutions.

A1 $\left(x^{\frac{1}{2}}\right)=3\pm\sqrt{5}$ Both required (though one may be later rejected) but need not be simplified, so accept $\frac{6\pm2\sqrt{5}}{2}$

M1 For attempting to square a solution of the form $p\pm q\sqrt{r}$ with 2 (out of 4) correct terms (may be implied by correct answers for their terms, but must have seen at least one solution for $x^{\frac{1}{2}}$)

A1 $x=14+6\sqrt{5}$ **or** $x=14-6\sqrt{5}$ as an answer Accept equivalents for this mark.

A1 $x=14+6\sqrt{5}$ **and** $x=14-6\sqrt{5}$ as answers, must be simplified.

Special Case: For candidates who show no initial working and write $x^{\frac{1}{2}}=3\pm\sqrt{5}$ as their first step, M0A0M1A1A1 is possible if they go on to achieve correct answers

Question Number	Scheme	Marks
8 Alt	$x+4=6x^{\frac{1}{2}}$ $\left(x+4\right)^2=36x$ $x^2-28x+16=0 \Rightarrow (x-14)^2=180 \Rightarrow x=14\pm\sqrt{180} \Rightarrow x=14\pm6\sqrt{5}$	 M1 A1 M1 A1 A1 **(5)**

M1 Isolates the square root term and squares both sides.

A1 Correct squared expression, $\left(x+4\right)^2$ need not be expanded (as in scheme).

M1 Expands and solves the quadratic in x Note that candidates who square term by term will score no marks.

A1A1 As main scheme. Note for the final A both solutions must be fully simplified.

Question Number	Scheme	Marks
9. (a)	24π	B1 **(1)**
(b)	$(18\pi, -1)$	B1ft **(1)**
(c)(i)	$-12\pi - \alpha$	B1 ft
(ii)	$6\pi - \alpha$	B1 ft **(2)** **(4 marks)**

(a) Do not allow the mark if an inequality or coordinates are given, but you may assume if $0 < x < p$ or $(p, 0)$ is given that their period is p for the purposes of the remaining marks.

See above
Note that (b) and (c) are for (correct or) follow through and hence
(b) is scored for $\left(\frac{3p}{4}, -1\right)$ -- this may be seen on the graph but take clearly labelled part (b) as precedent.
Follow through on $p \neq 2\pi$
(c) (i) is scored for $-\frac{1}{2}p - \alpha$
(ii) is scored for $\frac{1}{4}p - \alpha$
where p is their period stated in (a) (which may be 2π)

For answers in degrees penalise the first mark due only, but allow if degree symbol is missing.
For reference (a) 4320° (b) (3240°, −1) (c)(i) −2160° − α (ii) 1080° – α

Note for example that (a) $0 < x < 4320°$ (b) (3240°, −1) (c)(i) −2160° − α (ii) 1080° – α would score B0 B0 B1ft B1ft

Question Number	Scheme	Marks
10 (a)	$f(x) \leqslant 0 \Rightarrow \quad x \leqslant -\frac{5}{2}, \quad x = 3$	M1 A1