Question Number	Scheme	Marks
1(a)	$(-2, -3)$	B1
		(1)
(b)	$(-3, -9)$	B1B1
		(2)
(c)	$(-4, 3)$	B1
		(1)
		(4 marks)

In all parts, if more than 1 coordinate pair is offered then mark the "final" pair.

Accept missing brackets as long as the intention is clear e.g. $-2, -3$ **or** $(-2, -3$

(a)

B1: $(-2, -3)$. Allow $x = -2$, $y = -3$.

(b)

B1: One correct coordinate.

May be seen as part of a coordinate pair or written separately as $x = -3$ or $y = -9$.

B1: $(-3, -9)$. Allow $x = -3$, $y = -9$.

(c)

B1: $(-4, 3)$. Allow $x = -4$, $y = 3$.

Question Number	Scheme	Marks
2(a)	$\left(\text{f}(2)=\right)2^4-5(2)^2+4(2)-7=-3<0$ **and** $\left(\text{f}(3)=\right)3^4-5(3)^2+4(3)-7=41>0$	M1
	There is a change of sign and f(x) is continuous so there is a root (in the interval) *	A1*
		(2)
(b)	$x^3=\dfrac{5x^2-4x+7}{x}\Rightarrow x=\sqrt[3]{\dfrac{5x^2-4x+7}{x}}$ *	B1*
		(1)
(c)(i)	$x_2=\sqrt[3]{\dfrac{5(2)^2-4(2)+7}{2}}$	M1
	$=$ awrt 2.1179	A1
(ii)	$\alpha=$ awrt 2.1565	A1
		(3)
		(6 marks)

(a)

M1: Attempts both $\text{f}(2)$ and $\text{f}(3)$ or a narrower interval that contains the root 2.1565…and considers the signs. Note showing $\text{f}(2)\times\text{f}(3)<0$ or "< 0", "> 0" beside each appropriate root is a consideration of signs and is also sufficient for the "sign change" part of reasoning for the A1.

For the substitution, need to see the values substituted or at least one of f(2) or f(3) correct.

A1*: This mark requires:

- both $\text{f}(2)$ and $\text{f}(3)$ correct e.g. f (2) = –3 and f (3) = 41
- a reference to the sign change
- a reference to continuity
- a (minimal) conclusion

For **sign change**, allow equivalent statements e.g. f (2).f (3) < 0, f (2) < 0 < f (3) etc.

For **continuity**, allow just "continuous" and allow "assuming it is continuous" and "continuous equation" but do **not** allow incorrect statements such as "x is continuous", "the interval is continuous", "there is a change of sign therefore it is continuous"

For the **conclusion**, allow e.g. ✓, #, QED, hence shown, hence root, so it crosses the x-axis, etc., but **not** incorrect statements e.g. so there is a root in the interval $[-3, 41]$

You may have to use your judgement to decide if the A1 conditions are satisfied.

Example: f(2) = –3, f(3) = 41, there is a change of sign hence f(x) has a continuous root in [2, 3] Scores M1A0 – i.e. it is not the root that is continuous