Question Number	Scheme	Notes	Marks
3	$f(x)=x^3-5\sqrt{x}-4x+7$		
(a)	f(0.25)=3.515625, $\frac{225}{64}$, $3\frac{33}{64}$ f(1) = –1	Attempts both f(0.25) and f(1) with one correct allowing awrt 3.52 for f(0.25)	**M1**
	examples: "1" refers to "–1" with sign corrected $\frac{\alpha-0.25}{"3.515625"}=\frac{1-\alpha}{"1"}\Rightarrow\alpha=...$ $\frac{\alpha-0.25}{"\frac{225}{64}"}=\frac{1-\alpha}{"1"}\Rightarrow\alpha=...$ $\frac{\alpha-0.25}{"3.515625"}=\frac{1-0.25}{"3.515625"+"1"}\Rightarrow\alpha=...$ $\frac{1-\alpha}{"1"}=\frac{1-0.25}{"3.515625"+"1"}\Rightarrow\alpha=...$ $[\alpha-0.25=3.515625-3.515625\alpha$ $4.515625\alpha=3.765625]$	Forms an equation in α that is correct for their values and solves for α. Can use x etc. Allow e.g., "f(0.25)" and "-f(1)" in this equation provided values for these are seen. Any modulus signs must be applied and f(0.25) and f(1) must have had different signs. Can be implied by just awrt 0.83 or $\frac{241}{289}$ but otherwise a correct equation for their f(0.25) and f(1) must be seen but allow use of $\frac{af(b)-bf(a)}{f(b)-f(a)}\Rightarrow\frac{1("3.515625")-0.25("-1")}{"3.515625"-("-1")}$ or a correct partially processed equivalent and only allow formula followed by value if values for a, b, f(a) and f(b) are seen If e.g., A is used for $\alpha-0.25$ then must see $A+0.25$ later. Note that sight of 1.2981... or $\frac{209}{161}$ usually indicates a sign error.	**M1**
	$\alpha=0.834$	awrt 0.834 (0.8339100346...) Must be decimal. Ignore labelling and just look for this value. [Note: actual root is 0.767843...]	**A1**
			(3)
Alt for last 2 marks (straight line equation)	e.g., $y=\frac{"3.515625"-"(-1)"}{0.25-1}x+c$ $(1,"-1")\Rightarrow-1=-6.02083\dot{3}+c$ $\Rightarrow c=5.02083\dot{3}$ $y=0\Rightarrow\alpha=\frac{-5.02083\dot{3}}{-6.02083\dot{3}}=0.834$	M1: Any full method to find the equation of the line between (0.25, "3.515625") and (1, "–1") and then uses y = 0 to find a value for α. Condone errors finding c and α but the initial equation should be correct for their f(0.25) and f(1) and the x and y coordinates should always be correctly placed. A1: awrt 0.834	**M1** **A1**
(b)	$[f'(x)=]\ 3x^2-\frac{5}{2}x^{-\frac{1}{2}}-4$	M1: 2 correctly differentiated terms (this includes $7\to0$) Allow unsimplified e.g., $3\times x^{3-1}$ A1: Fully correct simplified derivative	**M1** **A1**
			(2)
(c)	$x_1=1.75-\frac{1.75^3-5\sqrt{1.75}-4(1.75)+7}{"3(1.75)^2-2.5(1.75)^{-0.5}-4"}$ $\left[=1.75-\frac{-1.255003278...}{3.297677635...}=1.75+0.38057...\right]$	Uses a correct Newton-Raphson formula with $x_0=1.75$ and their $f'(x)$ to obtain a numerical expression for x_1 but implied by awrt 2.13 (2.13057185). Working must be seen if x_1 is wrong – allow $"x_0=1.75,\ x_1=x_0-\frac{f(x_0)}{f'(x_0)}=..."$ or $1.75-\frac{f(1.75)}{f'(1.75)}=..."$	**M1**
	$x_1=2.13057185...\Rightarrow\beta=2.131$	awrt 2.131 (ignore labelling and just look for this value). Ignore further iterations. [Note: actual root is 2.011276...]	**A1**
			(2)
			Total 7