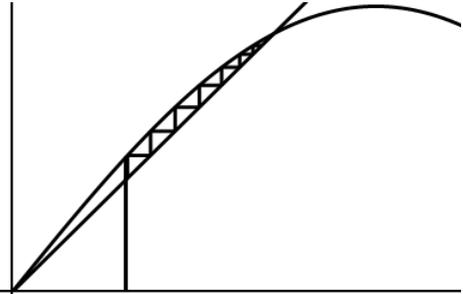
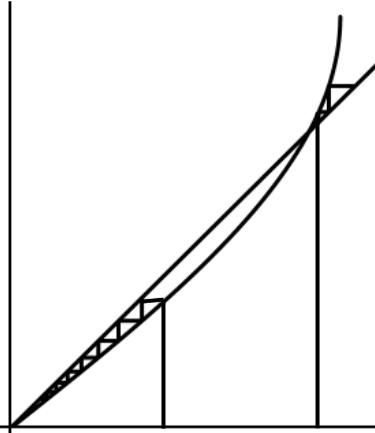


Question		Answer	Marks	AO	Guidance	
10	(a)	area $OMB = \frac{1}{2}(\frac{1}{2}r)r \sin \theta$	B1	1.1	Correct (possibly unsimplified) area of OMB	Could use other than r for the radius Could set their variable equal to OM , giving a radius that is double this eg $OM = x$ so area = $x^2 \sin \theta$
		$2(\frac{1}{2}r^2\theta - \frac{1}{4}r^2 \sin \theta) = 3(\frac{1}{4}r^2 \sin \theta)$	M1	3.1a	Attempt to use ratio on two correct areas	Using two of OMB ($\frac{1}{4}r^2 \sin \theta$), MAB ($\frac{1}{2}r^2\theta - \frac{1}{4}r^2 \sin \theta$) and OAB ($\frac{1}{2}r^2\theta$) or with their variable
		OR $2(\frac{1}{2}r^2\theta) = 5(\frac{1}{4}r^2 \sin \theta)$				Must be two correct areas Must be using the correct ratio for their two areas ie 2:3 if using OMB and MAB , 2:5 if using OMB and OAB or 3:5 if using MAB and OAB
		OR $3(\frac{1}{2}r^2\theta) = 5(\frac{1}{2}r^2\theta - \frac{1}{4}r^2 \sin \theta)$	A1	2.1	Correct equation, in two variables (ie θ and their r)	Allow ratio to be used the wrong way around eg $2OMB = 3MAB$
$\theta - \frac{1}{2} \sin \theta = \frac{3}{4} \sin \theta$ $\theta = 1.25 \sin \theta$ A.G.	A1	2.1	Simplify to given answer	Any correct statement linking the two areas Could use other than r for the radius Or $2x^2\theta - x^2 \sin \theta$ At least one line of working once ratio used		
			[4]			

Question			Answer	Marks	AO	Guidance	
10	(b)		0.599 0.705, 0.810 root = 1.13	B1 M1 A1 [3]	1.1a 1.1a 1.1	Obtain correct first iterate Attempt correct iterative process to find at least 2 more values Obtain 1.13	3sf or better – more accurate answer is 0.599281923... Condone truncating if more sig fig given M1 is for the correct process for finding θ_3 and θ_4 , but these may be incorrect M0 if working in degrees Possibly following B0 if first iterate is wrong but process then self corrects Must follow M1 ie a clear attempt to use the correct iterative process Must be 3sf Once M1 is awarded, allow A1 for 1.13 even if an incorrect iterate seen, as process will recover
10	(c)			B1*	3.1a	Draw $y = \theta$ on diagram	Draw straight line, starting at the origin which intersects the graph Allow point of intersection to be greater than $\theta = \frac{1}{2}\pi$ Ignore incorrect labels, such as $y = x$

Question			Answer	Marks	AO	Guidance	
				B1 dep*	2.1	Draw correct iterative process on diagram	Vertically into the curve, then horizontally into the straight line, as far as the root Initial value should be before root Needs point of intersection to be before $\theta = \frac{1}{2}\pi$
				B1	1.2	State 'staircase' convergence	Mark independently from other parts of question, including an incorrect diagram, as staircase can be deduced from the iterates in (b)
				[3]			
10	(d)			B1*	3.1a	Draw graph of $y = \sin^{-1}0.8\theta$, for $\theta \geq 0$	Just need correct shape for $y = \sin^{-1}k\theta$ graph – a one to one function that starts at the origin (ignore any $\theta < 0$) and has increasing gradient for all θ
				B1 dep*	3.2a	Draw $y = \theta$, and show staircase divergence from the root found in (b) , on at least one side of the root	Straight line from the origin to intersect their graph Diagram is sufficient for B1 – no comment or explanation required
				[2]			