

Question			Answer	Marks	AO	Guidance
6	(a)	(i)	DR $\cos 3\theta = \cos (2\theta + \theta)$ $= (2\cos^2\theta - 1) \cos\theta - 2\sin\theta\cos\theta\sin\theta$ $= 2\cos^3\theta - \cos\theta - 2(1 - \cos^2\theta) \cos\theta$ $= 4\cos^3\theta - 3 \cos\theta$ AG	B1 B1	1.1 1.1	Condone a small slip in early irrelevant working before substituting, but must be fully correct after this. oe in terms of θ , not 2θ May be implied by next line oe in terms of $\cos\theta$ only Must reach AG or give a conclusion (even if just ‘QED’) www
			Alternative 1 $= (\cos^2\theta - \sin^2\theta) \cos\theta - 2\sin\theta\cos\theta\sin\theta$ $= \cos^3\theta - (1 - \cos^2\theta) \cos\theta - 2(1 - \cos^2\theta) \cos\theta$ $= 4\cos^3\theta - 3 \cos\theta$ AG	B1 B1		oe in terms of θ , not 2θ May be implied by next line oe in terms of $\cos\theta$ only Must reach AG or give a conclusion (even if just ‘QED’) www
			Alternative 2 $= (1 - 2\sin^2\theta) \cos\theta - 2\sin\theta\cos\theta\sin\theta$ $= (1 - 2(1 - \cos^2\theta)) \cos\theta - 2(1 - \cos^2\theta) \cos\theta$ $= 4\cos^3\theta - 3 \cos\theta$ AG	B1 B1		oe in terms of θ , not 2θ May be implied by next line oe in terms of $\cos\theta$ only Must reach AG or give a conclusion (even if just ‘QED’) www
				[2]		
6	(a)	(ii)	DR $\cos 3\theta = \frac{\sqrt{2}}{2}$ $3\theta = 45^\circ \text{ or } 315^\circ \text{ or } 405^\circ$ $\theta = 15^\circ \text{ or } 105^\circ \text{ or } 135^\circ$	M1 A1 A1 [3]	1.1 1.1 1.1	oe Allow A1 for two correct values of 3θ . Ignore other values. This mark is not implied by correct final answers but accept equivalent correct working e.g. a graph of $\cos 3\theta$. Accept radians for this mark only: $3\theta = \frac{\pi}{4}, \frac{7\pi}{4}, \frac{9\pi}{4}$ cao. Ignore values outside of the range 0-180°, but do not accept radians for this mark. This mark may be given following M1A0.

Question			Answer	Marks	AO	Guidance
6	(b)	(i)	DR $4x^3 - 2\sqrt{2}x^2 - x + 2\sqrt{2}x^2 - 2x - \frac{\sqrt{2}}{2}$ oe $= 4x^3 - 3x - \frac{\sqrt{2}}{2}$ AG	B1 [1]	1.1	Must see a correct multiplied out form and AG or conclusion.
6	(b)	(ii)	DR $x = -\frac{\sqrt{2}}{2}$ $x = \frac{\sqrt{2} + \sqrt{6}}{4}$ and $x = \frac{\sqrt{2} - \sqrt{6}}{4}$ oe	B1 B1 [2]	2.1 1.1	oe, must be exact May see $x = \frac{2\sqrt{2} \pm \sqrt{24}}{8}$ etc.
6	(c)		DR cos 15° is a root of the equation in (b)(ii) (a)(ii): cos 105° < 0, cos 135° < 0, cos 15° > 0 (b)(ii): $-\frac{\sqrt{2}}{2} < 0$ and $\frac{\sqrt{2}-\sqrt{6}}{4} < 0, \frac{\sqrt{2}+\sqrt{6}}{4} > 0$ $\cos 15^\circ = \frac{\sqrt{2}+\sqrt{6}}{4}$ AG	B1 B1 [2]	2.4 3.2a	soi - for ‘spotting’ the connection. This mark can be gained regardless of their answers to (a)(ii) and (b)(ii) . $x = \cos \theta$ or 3 correctly paired roots are sufficient for this mark Condone $x = \cos 15$ Justification for selecting this root (may say e.g. “cos 15 is the only positive root”) This may be implied by matching each pair of answers correctly (but all three must be present or mentioned).