Question	Scheme	Marks	AOs
4a	$2\alpha+\frac{1}{2}\left(1-\frac{\alpha^2}{2}\right)$	M1	1.2
	$2\alpha+\frac{1}{2}\left(1-\frac{\alpha^2}{2}\right)=0\Rightarrow 2\alpha+\frac{1}{2}-\frac{\alpha^2}{4}=0 \ \Rightarrow \alpha=...$	dM1	1.1b
	$\alpha=-0.243$ (3dp) only	A1	2.3
		(3)	
b	$f'(0)=\frac{1}{2}\cos 0\Rightarrow ...\Rightarrow y=...x+3$	M1	1.1b
	$y=\frac{1}{2}x+3$	A1	1.1b
		(2)	
			(5 marks)

Notes

(a) **Note on EPEN this is M1A1A1 but we are marking this as M1dM1A1**

Accept to be in terms of α or another variable e.g. x

Note: -0.243 **with no working is 0 marks**

M1: Fully substitutes $\cos x=1-\frac{x^2}{2}$ into the derivative.

dM1: Attempts to multiply out to achieve a 3TQ (= 0) **and** attempts to find a value for α. Condone slips. Allow solving the quadratic via any method (usual rules apply).

If they use a calculator then you may need to check this.

A1: $(\alpha=)-0.243$ only cao Can only be scored provided a correct 3TQ is seen. If both roots found then the other one must be rejected (or a choice made of -0.243 e.g. underlining it or a tick)

Condone $x=-0.243$

(b)

M1: Attempts to find the gradient of the curve when $x=0$ and achieves an equation of the form $y="f'(0)"x+3$.

$x=0$ must be fully substituted in and a value must be found for the gradient. Do not allow this mark if they attempt to use a changed gradient e.g. the gradient of the normal.

Also allow attempts using the small angle approximation:

$f'(x)\approx 2x+\frac{1}{2}\left(1-\frac{x^2}{2}\right)$ when $x=0$, $f'(0)="\frac{1}{2}"\Rightarrow y="f'(0)"x+3$

A1: $y=\frac{1}{2}x+3$ or equivalent in the form $y=mx+c$ isw Stating just the values $m=0.5$, $c=3$ without the correct equation is A0