

Cambridge International AS & A Level

Mathematics 9709

Paper 1 Pure Mathematics 1

Topic 5-Trigonometry

Question No (24)

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The reflex angle θ is such that $\cos \theta = k$, where $0 < k < 1$.

(i) Find an expression, in terms of k , for

(a) $\sin \theta$,

(b) $\tan \theta$.

(ii) Explain why $\sin 2\theta$ is negative for $0 < k < 1$.

Solution

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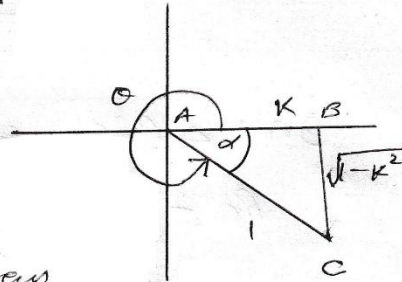
As given $0 < k < 1$, so associated acute angle α lies in 4th quadrant, as θ is reflex as well.

$$\cos \alpha = \frac{\text{base}}{\text{hyp}} = \frac{k}{1}$$

using Pythagoras theorem

in $\triangle ABC$

$$BC = \sqrt{1 - k^2}$$



$$\textcircled{a} \quad \sin \theta = -\sin \alpha = -\frac{\sqrt{1-k^2}}{1} = -\sqrt{1-k^2}$$

$\therefore \sin$ is -ve in 4th quadrant

$$\textcircled{b} \quad \tan \theta = -\tan \alpha$$

$$\tan \theta = -\frac{\sqrt{1-k^2}}{k}$$

$\therefore \tan$ is -ve in 4th quadrant

$\textcircled{ii}$

$$\text{As } 270^\circ < \theta < 360^\circ$$

$$\Rightarrow 540^\circ < 2\theta < 720^\circ$$

$\sin 2\theta$ is -ve in

$$540^\circ < 2\theta < 720^\circ$$

for $0 < k < 1$.

