

For each positive integer n , let $f_n(\vartheta) = \sin \vartheta \cdot \sin(2\vartheta) \cdot \sin(4\vartheta) \cdots \sin(2^n \vartheta)$. For all real ϑ and all n , prove that

$$|f_n(\vartheta)| \leq \frac{2}{\sqrt{3}} |f_n(\pi/3)|.$$