

1-st Mediterranean Mathematical Competition 1998

1. A square $ABCD$ is inscribed in a circle. If M is a point on the shorter arc AB , prove that $MC \cdot MD > 3\sqrt{3} \cdot MA \cdot MB$.
(Greece)
2. Prove that the polynomial $z^{2n} + z^n + 1$ ($n \in \mathbb{N}$) is divisible by the polynomial $z^2 + z + 1$ if and only if n is not a multiple of 3.
(Croatia)
3. In a triangle ABC , I is the incenter and D, E, F are the points of tangency of the incircle with BC, CA, AB , respectively. The bisector of angle BIC meets BC at M , and the line AM intersects EF at P . Prove that DP bisects the angle FDE .
(Spain)