



Algerian Mathematical Olympiad - Second Edition 2025

Category: Senior

July 3rd, 2025

Problem 1 Let ABC be an acute triangle with circumcircle ω . Let D be the intersection of ω with the angle bisector of $\angle BAC$. Let E be on $[DC)$ and assume that the circumcircle of triangle ACE meets $[BC]$ at F . Let (DF) meet ω and (ACF) at G and H , respectively.

Prove that $(GC) \parallel (HE)$.

Problem 2. Find all positive integers a, b such that $a^2 + ab + b^2 = p^k$ and $ab = m^2$ for some prime p and positive integers m, k .

Problem 3. Find all surjective functions $f : \mathbb{Q}^* \rightarrow \mathbb{Q}^*$ such that:

$$(f(x) + f(y))f(x + y) = f(xy)$$

for all $x, y \in \mathbb{Q}^*$ with $x + y \neq 0$.