

Flanders Math Olympiad 1999

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by Peter, pbornsztein

1 Determine all 6-digit numbers $(abcdef)$ so that $(abcdef) = (def)^2$ where $(x_1x_2\dots x_n)$ is no multiplication but an n -digit number.

2 Let $[mn]$ be a diameter of the circle C and $[AB]$ a chord with given length on this circle. $[AB]$ neither coincides nor is perpendicular to $[MN]$.
Let C, D be the orthogonal projections of A and B on $[MN]$ and P the midpoint of $[AB]$.
Prove that $\angle CPD$ does not depend on the chord $[AB]$.

3 Determine all $f : \mathbb{R} \rightarrow \mathbb{R}$ for which

$$2 \cdot f(x) - g(x) = f(y) - y \text{ and } f(x) \cdot g(x) \geq x + 1.$$

4 Let a, b, m, n integers greater than 1. If $a^n - 1$ and $b^m + 1$ are both primes, give as much info as possible on a, b, m, n .
