Problem 1. The number 2021 is fantabulous. For any positive integer $m$, if any element of the set $\{m, 2m + 1, 3m\}$ is fantabulous, then all the elements are fantabulous. Does it follow that the number 2021 is fantabulous?

Problem 2. Find all functions $f: \mathbb{Q} \to \mathbb{Q}$ such that the equation

$$f(xf(x) + y) = f(y) + x^2$$

holds for all rational numbers $x$ and $y$.

Here, $\mathbb{Q}$ denotes the set of rational numbers.

Problem 3. Let $ABC$ be a triangle with an obtuse angle at $A$. Let $E$ and $F$ be the intersections of the external bisector of angle $A$ with the altitudes of $ABC$ through $B$ and $C$ respectively. Let $M$ and $N$ be the points on the segments $EC$ and $FB$ respectively such that $\angle EMA = \angle BCA$ and $\angle ANF = \angle ABC$. Prove that the points $E$, $F$, $N$, $M$ lie on a circle.