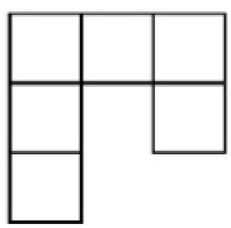
1. Let $ABC$ be an acute-angled triangle with $AB \neq AC$.The circle with diameter $BC$ intersects the sides $AB$ and $AC$ at $M$ and $N$ respectively.Denote by $O$ the midpoint of the side $BC$.The bisector of the angles $<BAC$ and $<MON$ intersects at $R$.Prove that the circumcircles of the triangles $BMR$ and $CNR$ have a common point on the side $BC$

2. Find all polynomials of $f$ with real coefficient such that for all reals $a, b, c$ such that $ab + bc + ca = 0$ We have the following relations
$f(a-b)+f(b-c)+f(c-a) = 2f(a+b+c)$

3. Define a "hook" to be a figure made up of six unit squares as shown below in the picture,or any of the figures obtained by applying rotations and reflections to this figure. Determine all mxn rectangles that can be covered without



gaps and without overlaps with hooks such that
• the rectangle is covered without gaps and without overlaps
• no part of a hook covers area outside the rectangle.

4. Let n ≥ 3 be an integer.Let $t_1, t_2 ...... t_n$ be positive real numbers such that
$n^2 + 1 > (t_1, t_2 ...... t_n)\left(\frac{1}{t_1} + \frac{1}{t_2} + .......\frac{1}{t_n}\right)$

5. In a convex quadrilateral ABCD the diagonal BD does not bisect the angles ABC and CDA.The point P lies inside ABCD and satisfies

$$\angle PBC = \angle DBA and \angle PDC = \angle BDA.$$

Prove that ABCD is a cyclic quadrilateral if and only if AP=CP

6. We call a positive integer alternating if every two consecutive digits in its decimal representation are of different parity.Find all positive integers $n$ such that $n$ has a multiple which is alternating