1. Find all natural numbers \( m \) such that
\[
1! \cdot 3! \cdot 5! \cdots (2m - 1)! = \left( \frac{m(m + 1)}{2} \right)!.
\]

2. In a triangle \( ABC \), the altitude from \( A \) meets the circumcircle again at \( T \). Let \( O \) be the circumcenter. The lines \( OA \) and \( OT \) intersect the side \( BC \) at \( Q \) and \( M \), respectively. Prove that
\[
\frac{S_{AQC}}{S_{CMT}} = \left( \frac{\sin B}{\cos C} \right)^2.
\]

3. Prove that if \( a, b, c \) are positive numbers satisfying \( 1 = ab + bc + ca + 2abc \), then
\[
2(a + b + c) + 1 \geq 32abc.
\]

4. Let \( z_1, z_2, z_3 \) be pairwise distinct complex numbers satisfying \( |z_1| = |z_2| = |z_3| = 1 \) and
\[
\frac{1}{2 + |z_1 + z_2|} + \frac{1}{2 + |z_2 + z_3|} + \frac{1}{2 + |z_3 + z_1|} = 1.
\]
If the points \( A(z_1), B(z_2), C(z_3) \) are vertices of an acute-angled triangle, prove that this triangle is equilateral.