1. Prove that the decimal integer of the form 20182018...201820182019 cannot be a perfect square.

2. Prove that \[ \sum_{1 \leq m < n \leq 2018} \frac{1}{mn} \] is not an integer.

3. Evaluate \[ \int_{0}^{\pi} \arccot(\cos x) \, dx. \] (Here “arccot” stands for arccotangent, the inverse of the cotangent function.)

4. Prove that the perpendicular bisector of the line joining the feet of two altitudes of a triangle bisects the third side of the triangle.

***PICTURE***

5. Let \( 0 < \alpha, \beta < \pi/2 \) and assume that \( \sin^2 \alpha + \sin^2 \beta = \sin(\alpha + \beta) \). Prove that \( \alpha + \beta = \pi/2 \).

6. Prove that for any positive integer \( n \), \( (2n + 1)^n \geq (2n)^n + (2n - 1)^n \).