**Problem 1**

Consider parallelogram $ABCD$, $|AB| \neq |BC|$. Let $E$ be the intersection of the perpendicular to the diagonal $AC$ dropped from the point $D$ with the line $BC$ and let $F$ be the foot of the perpendicular from the point $B$ to the line $DE$. Assuming that the lines $CF$ and $AE$ perpendicular, determine the angle $ACB$.

![Figure 1 – Parallelogram](image)
Problem 2
Consider a triangle \( ABC \) and its circumscribed circle \( k \). On the circle choose an arbitrary point \( P \) and inside the triangle select an arbitrary point \( G \). Consider circles \( GAB, GBC, GCA \). Denoting \( P_{AB}, P_{BC}, P_{CA} \) the inverse images of the \( P \) with respect to the circles, prove or answer following statements:

a) Points \( P_{AB}, P_{BC}, P_{CA} \) and \( G \) lie on a circle \( C \).

b) As \( P \) moves along the circle \( k \), the centre of the circle \( C \) moves along a line.

c) Determine in the triangle a point \( G = G_L \) in such a way that the points \( P_{AB}, P_{BC}, P_{CA} \) and \( G_L \) are always collinear (we consider a line as a special case of a circle).

Hint: Apply the Simson-Wallace theorem.

Problem 3
On a circle \( k \) are arbitrarily selected points \( A, B, C, D \). Denote the orthocenter of the triangle \( ABC \) as \( H_D \) and analogically introduce the orthocenters \( H_A, H_B, H_C \). Prove that the orthocenters lie on a circle with its radius equal to the radius of the circle \( k \).