Épreuve de section européenne

1 General knowledge

What is the definition of a continuous function ? State a few theorems concerning continuous functions.

2 Document

Proposition
If two circles touch at A, and if BD, EF be parallel diameters in them, ADF is s straight line.

Proof : Suppose that the two circles touch internally. Let O be the centre of the circle passing through E and F and C be the center of the circle passing through B and D.

Let OC be joined and produced to A. Draw DH parallel to AO meeting OF in H.

Then, since $OH = CD = CA$, and $OF = OA$, we have, by subtraction, $HF = CO = DH$.

Therefore $\angle HDF = \angle HFD$.

Thus both the triangles CAD, HDF are isosceles, and the third angles ACD, DHF in each are equal. Therefore the equal angles in each are equal to one another, and

$$\angle ADC = \angle DFH.$$

Add to each the angle CDF, and it follows that

$$\angle ADC + \angle CDF = \angle CDF + \angle DFH = \text{(two right angles)}.$$

Hence ADF is a straight line.

The same proof applies if the circles touch externally.

From the *Book of Lemmas*, by Archimedes of Syracuse.

3 Questions

1. There are a few notations in this text that differ from the ones used in France nowadays. Which ones ?
2. Draw a figure illustrating the situation and the proof.
3. Redo the proof with the circles touching externally.