Closed book. Closed Notes. May only use the Definitions-Axioms-Theorems handout, with no writings on it. 20 points per problem. Please write very legibly.

Please do not write in this area.   1.   2.

1. (a) (5 points) Give the definition of the defect of a quadrilateral in hyperbolic geometry.

    (b) (15 points) Let $ABCD$ be a quadrilateral, and let A-X-B and C-Y-D. In hyperbolic geometry, is the following true or false: $d(ABCD) = d(AXYD) + d(BXYC)$? Prove your answer. ($d$ denotes defect.)

2. (20 points) Prove Theorem 3.3: In neutral geometry, every triangle has angle sum less than or equal to 180°. You may use theorems prior to Theorem 3.3.