1. For those who have not already finished problem 3 of the midterm, you may do so.

2. Show that the area of an asymptotic triangle in $\mathcal{H}^2$ is π.

3. The goal of this problem is to compute an analogue of Theorem 4.11 for polygons in $\mathcal{H}^2$.

a) Show that if P is a triangulated polygon, then

$$2(T - E + V) = -T + 2V_I + V_B$$

where V_I is the number of vertices inside the polygon and V_B is the number of vertices on the boundary. Hint: Modify the formula $3T = 2E$ and use the fact that $V_B = E_B$ (i.e. the number of boundary edges and vertices is the same.).

b) If $A(P)$ is the area of the polygon, show that

$$A(P) = \pi T - 2\pi V + \sum_k \alpha_k$$

where the sum is over the boundary vertices and α_k is the angle **outside the polygon** between the boundary edges meeting at boundary vertex v_k.

c) Show that

$$-A(P) = -\pi T + 2\pi V_I + \pi V_B + \sum_k (\pi - \alpha_k).$$

d) Rewrite the previous formula in terms of $\chi(P)$.

e) What is the value of $\chi(P)$ anyways?

f) What is the meaning of the sum $\sum_k (\pi - \alpha_k)$? Note that α_k lives between 0 and 2π.