Math 431 Homework 10
Due 12/8

You will need some of these definitions. Our definining groups were not working deligently, so I offer some thoughts. In Theorem 4.3 we said that one can, in a unique way, assign lengths to segments so that certain conditions are satisfied (see class25 or book, page 122). If we use lengths, we can make following definitions.

Definitions Let l be a line and P a point not on l. The *distance* from P to l is the length of the segment between P and the foot of the perpendicular [1] to l through P. If r is a ray such that $r \subset \{l\}$ and the foot of the perpendicular to l through P is contained in r, then we define the distance from P to r to be the distance from P to l.

A point P is said to be *equidistant* from lines l_1 and l_2 (or rays r_1 and r_2) if the distance from P to l_1 (r_1) is equal to the distance from P to l_2 (r_2).

One can define *equidistance* without talking about lengths, and using only our undefined term congruence.

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1. Prove: **Theorem 4.4**: Angle bisectors in a triangle meet at a point.

2. Prove: **Theorem 4.5**: A point P lies on the angle bisector of $\sphericalangle BAC$ if and only if it is equidistant from the sides of $\sphericalangle BAC$.

3. Let $\triangle ABC$ be a triangle and let $A * D * B$. If CD is a median and $\overrightarrow{CD}$ is the angle bisector of $\sphericalangle ACB$ show that $\triangle ABC$ is isosceles.

Some hints for the previous problems are in the Class # 30.

[1] Foot of the perpendicular to l throught P is the intersection of the line perpendicular to l passing through P and l