Name: _____

Homework #2: Incircles and Excircles **College Geometry**

In this activity you will carry out some basic constructions using GeoGebra. If you have never used GeoGebra before, don't worry; for what we need it to do, it is fairly straightforward. If you get stuck, ask for help!

Each of the following problems should be constructed on a separate file, and these files should be given descriptive titles **including your name and the activity number**. When you are finished, email the files to me. So I should get four files from you, with names like "Nathan Bloomfield - A1 - construct equilateral triangle.ggb".

Finally, **your constructions must be robust**. Every geometric construction starts with one or more *free elements*; these are points and lines given in the hypotheses of the construction proof. You should be able to **move the free elements around** without destroying your construction.

1. **Construct the bisector of an angle.** Start by placing three free points a, b, and o and draw rays $\overrightarrow{oa}$ and $\overrightarrow{ob}$. Following the proof we gave in class, construct the bisector of angle $\angle aob$.

   Make your construction into a GeoGebra tool.

2. **Construct the foot of a point on a line.** Start by placing three free points a, b, and p, and draw the line $\overleftrightarrow{ab}$. Following the proof we gave in class, construct the foot of p on $\overleftrightarrow{ab}$.

   Make your construction into a GeoGebra tool.

3. **Construct the incircle of a triangle.** Start by placing three free points a, b, and c, and draw the sides of triangle $\triangle abc$. Following the proof we gave in class, construct (1) the incenter o of $\triangle abc$, (2) the feet of o on the sides of $\triangle abc$, and (3) the incircle of $\triangle abc$.

   Make your construction into a GeoGebra tool.

4. **Construct the excircles of a triangle.** Start by placing three free points a, b, and c, and draw the *extended* sides of triangle $\triangle abc$ – that is, the lines $\overleftrightarrow{ab}$, $\overleftrightarrow{bc}$, and $\overleftrightarrow{ac}$. Following the proof we gave in class, construct (1) the excenter o of $\triangle abc$ at a, (2) the feet of o on the extended sides of $\triangle abc$, and (3) the excircle of $\triangle abc$ at a.

   Make your construction into a GeoGebra tool. Use this tool to construct the excircles of $\triangle abc$ at b and c.