Rotation assignment 1 name:_______________________________

A rotation will be defined as a function $f:\mathbb{R}^2 \to \mathbb{R}^2$ that, given a point P and an angle α, if A is any point on the plane, then $\text{dist}(A,P) = \text{dist}(f(A),P)$ and $\angle APf(A) \cong \alpha$

1. Figure out how: Given a point A and a point X
Describe how to find a point P, and describe/name an angle α to define a rotation where $f(A) = X$

2. If the point P you used in #1 was the midpoint of the segment $\overline{AX}$, describe how to get another fixed point and angle that works to define a rotation where $f(A) = X$. Find a way to get a fixed point using only a compass.

3. Think about spheres: Does your strategy for finding a rotation point and angle also work for two (let's say non-antipodal) points on a sphere? If so, why do you think it will still work. If you think now, what do you think might go wrong?

4. Is there any way to make this work for antipodal points on the sphere? How would you do it?

5. Figure out what:

Given points A, B, C, if I use A as the fixed point, and I use $\angle BAC$ as the angle of rotation of f, it's usually true that $f(B) \neq C$ --that is to say, B can be thought of as moving in the direction of C, but it doesn't land directly on C.

a. Draw a picture to show what this looks like:

b. Where is $f(B)$? (Where does B land?) (compared to A and C).

6. Given ΔABC and ΔDEF, define/describe a function that is a composition of two rotations (specify how to get the fixed points and angle), where the final (composed) function $h: \mathbb{R}^2 \to \mathbb{R}^2$ maps: $h(A) = D$ and $h(B) \in \overrightarrow{DE}$