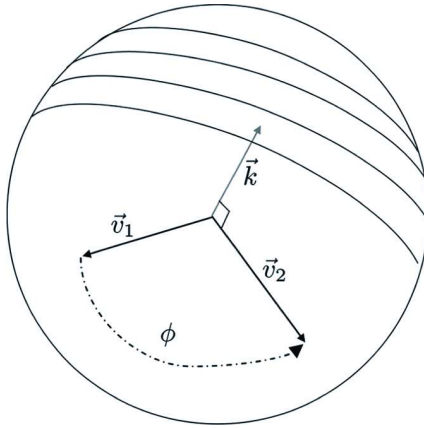# Question Set 7

CS 320

Chapter 8

1. Consider the following figure:

The vectors $\vec{v_1}$ and $\vec{v_2}$ extend from the center of the arcball to points on the surface of the sphere represented by the arcball. Let the points be $\tilde{p}_1$ and $\tilde{p}_2$ respectively. Let the center of the arcball be $\tilde{c}$. Starting from these three points, write pseudo-code to construct:

   (a) $\vec{k}$. Also, what does $\vec{k}$ represent?

   (b) The angle ϕ.

   (c) The quaternion representing the rotation from $\vec{v_1}$ to $\vec{v_2}$.

2. Referring to the previous figure, the arcball interface uses the quaternion $[\cos\phi, \sin\phi \; \hat{\mathbf{k}}]^t$ to represent the rotation from $\vec{v_1}$ to $\vec{v_2}$. This causes the rotated object to rotate twice as far as expected. Why?

3. For the arcball interface, given two raw mouse click points $[x_1, y_1]^t$ and $[x_2, y_2]^t$, write pseudo-code to convert them to the vectors $\vec{v_1}$ and $\vec{v_2}$. Assume that you have the arcball's `RigTform`. You will need to use the `getScreenSpaceCoord()` function described in the *Implementing an Arcball Interface* reading.

4. Given the vectors $\vec{v_1}$ and $\vec{v_2}$, write pseudo-code to construct the `RigTform` corresponding to the rotation between them.