Mathematics 308—Fall 1996

Fourth homework—due Wednesday, November 6

1. Write a procedure to build the shortest path on the unit sphere between two points P_1, P_2 specified in terms of their spherical coordinates (φ, θ). Use `mkpath3d` in your procedure. Demonstrate your procedure by drawing the spherical triangle with vertices at Vancouver, London, and Moscow. Draw the triangle in gray with a black outline. Show several positions for the globe. If you are ambitious, try to correct your program so it shows only the part of the triangle that would be visible on a solid sphere.

2. Write a PostScript program which uses `mkpolygon3d` to draw the unit cube in any position in space. The drawing should just draw the whole one-dimensional frame of the cube, projected onto the (x, y) plane.

3. Modify the previous program to incorporate perspective, assuming the observer located at the origin, and the plane onto which things are drawn to be the plane $z = 1$.

4. Modify the previous program so as to draw only the faces that would be visible if the cube were solid.

5. Write a program that animates the located cube in the previous exercise by spinning it around the axis through its top and bottom, illustrating what it looks like every 10° of rotation.