Mathematics 308—February 12, 1996

Third homework — due Wednesday, March 6

Exercise 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 the projection onto the equatorial plane to do the drawing. Demonstrate your procedure by drawing the triangle with vertices at Vancouver, London, and Moscow.

Exercise 2. Write a PostScript procedure which draws the unit cube in any position in space. The parameter passed to the procedure should be an array specifying the location of the cube. The drawing should just draw the whole one-dimensional frame of the cube, projected onto the (x, y) plane. (I shall explin in class what the 'location matrix' looks like.)

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

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

Exercise 5. Wrie a program (not a procedure) 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.