## Combinatorial Geometry
Nein (Problem Set)

Instructions: Again, do any two of these problems. They're due on Thursday, April 28.

(1) Hey! Prove that the matrix

$$\begin{pmatrix} \cos x & -\sin x \\ \sin x & \cos x \end{pmatrix}$$

will rotate a point (x, y) about the origin counterclockwise by an angle of θ.

(2) Verify the "matrix theorem" we saw in class for the below degree 4 vertex fold. (That is, construct the matrices $R(L_1), R(L_2), R(L_3),$ and $R(L_4)$ and show that multiplying them gives the identity.)
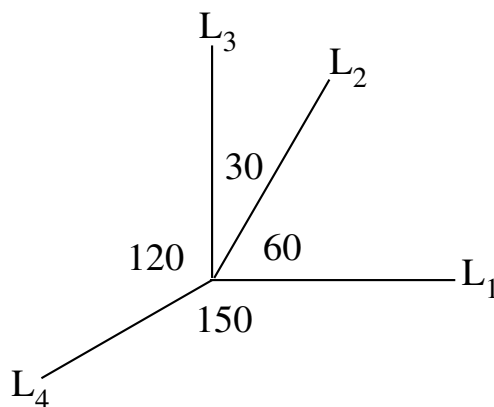
(3) Try your hand at origami design: **Make a duck!** You'll need two flaps for the legs and one for the head. (You might also need a short flap for the tail, but don't worry about that.) So try to find the most symmetric way you could arrange three circular arcs of the same size on a square piece of paper, connect the centers of these circles with lines, and do the Rabbit-Ear Theorem. Hopefully this will give you a base from which you could make a duck. Try it! (Your write-up should describe how you designed the model and show me the crease pattern, as well as the finished model.)