Module Hmw 2
Matrix Product
Math3323
Spring 2009

Name:

For this homework use “Matrix Product” module at the site http://www.math.utep.edu:8080/jsp/index.html (you may need to copy and paste if you can not access the site just by clicking the link).

Module Description

This module is designed to provide matrices and the resultant matrices from matrix multiplications from a geometric perspective. Matrices are formed by dragging the points P, Q and R, S, respectively. The resulting matrices from multiplying the two matrices are displayed in gray and brown colors.

The ``Reset'' button changes both matrices to the identity matrix;

Assignment:

First we think about "flat" (singular) matrices.

1. Make the blue parallelogram "flat", i.e., have no interior, by putting points Q and P on the same line (or as close as you can manage). What happens to the gray and brown product matrices? Try changing the purple parallelogram? How does this change your observation about the gray and brown product matrices? Explain your answers.

2. Reset the diagram, and repeat step 1 above with the purple parallelogram: Make it "flat", i.e., have no interior, by putting points R and S on the same line (or as close as you can manage). Once again, observe what happens to the gray and brown product matrices. State your observations.

3. Find other ways to get the brown and/or gray product matrices to be flat. Explain the ways you made the brown and/or gray product matrices flat.

Now we look at the effect of picking some particular matrices for the blue and purple parallelograms.

4. Make the blue parallelogram coincide with the yellow square by putting P in the lower right corner of the yellow square, and Q in the upper left corner of the square. What happens to the gray and brown product matrices? Try moving around the purple parallelogram (by moving points R and S). How does this change your observation about the gray and brown product matrices? Explain your answers.
5. Now flip the blue parallelogram by putting point P in the upper left corner of the yellow square, and point Q in the lower right corner of the yellow square. (Note that we have "flipped" or reflected the blue parallelogram.) What happens to the gray and brown product matrices? Try moving around the purple parallelogram (by moving points R and S). How does this change your observation about the gray and brown product matrices? Explain your answer.

6. Now put point P at about coordinates (0.86, 0.5) and point Q at about coordinates (-0.5, 0.86). [Note: the coordinates of P are in the left column of the blue matrix, and the coordinates of Q are in the right column of the blue matrix.] Note that we seem to have rotated the blue parallelogram from its position on top of the yellow square. Keeping the blue parallelogram where it is, move the purple parallelogram around (by moving points S and R). Can you describe the location and shape of the gray matrix as you move the purple parallelogram? (Note that the brown matrix would be harder to describe in this case) Explain your answer.