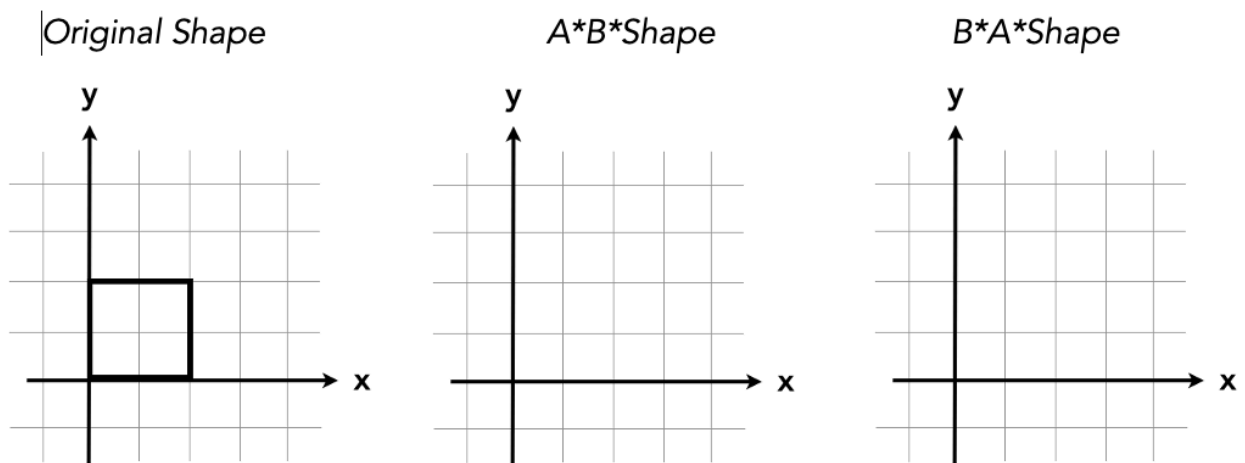


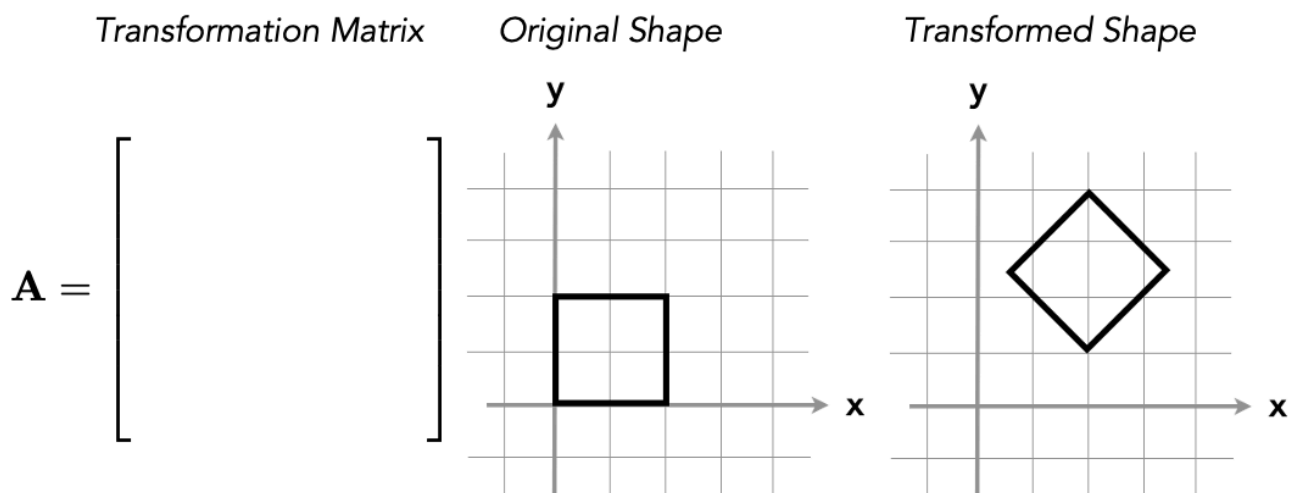
CSCI 480/580 Lecture 15 - In-Class Problems

- In this problem, you'll give a geometric proof that matrix multiplication is not commutative (i.e., $AB \neq BA$) in general.

Find two 2×2 transformations, A and B , such that applying B then A results in a different picture than applying A then B . Given the unit square in the left column below, draw the shape with AB applied in the middle column and with BA applied in the right column. You may simply give a description of each transformation rather than writing out the matrix.



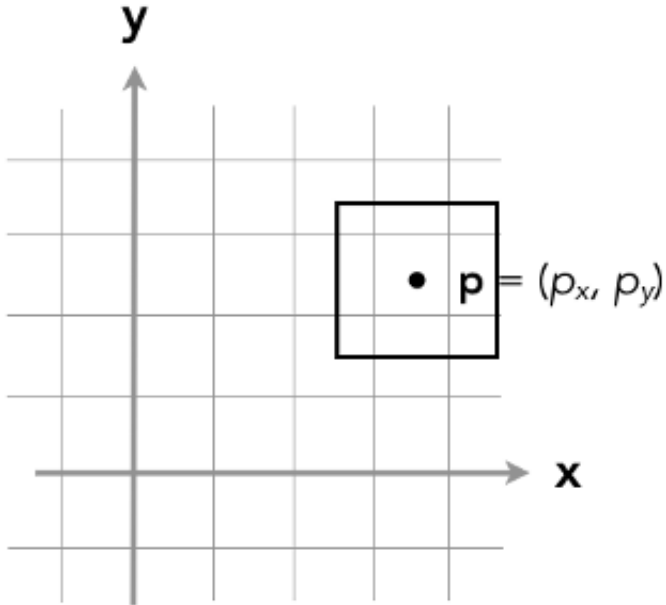
- Find an affine transformation matrix A that transforms the unit square shown in the middle column to the shape in the right column.



- Consider the shape illustrated below; suppose it's a unit square centered at the point (p_x, p_y) . Construct a transformation that rotates the shape 45 degrees counter-clockwise **around its center**, (not around the origin). Hint: you may find it useful to build your transformation by composing multiple simpler transformations. If you do this, you don't need to write out the elements of the final matrix; just write out each of the matrices you're composing and the order

in which they are composed.

Original Shape



Transformed shape: (forgive the drawings scales not matching - the square's side length is not changed by the transformation).

