HOMEWORK 2

(Math 140)

1. Show that if A and B are rotations of $\Re^2$, then $AB = BA$. Is the same true for rotations in $\Re^3$? (20 pts)

2. Given $A = \begin{pmatrix} 1 & -1 & 0 \\ 2 & -3 & 2 \\ 0 & 1 & -1 \end{pmatrix}$, find A^{-1}. (20 pts)

3. Let A be a 3×3 matrix. Show that $|cA| = c^3 |A|$. (20 pts)

4. Rotation of a figure about a point P in $\Re^2$ is accomplished by first translating the figure by $-P$, rotating about the origin, and then translating back to P. Construct a 3×3 matrix A that rotates points by $45°$ about the point (1,2), using homogeneous coordinates. (20 pts)

5. Given the basis $A = \begin{pmatrix} 1 & 0 \\ 0 & 2 \end{pmatrix}$, $B = \begin{pmatrix} 0 & 1 \\ 0 & -1 \end{pmatrix}$, $C = \begin{pmatrix} 0 & 0 \\ -2 & 1 \end{pmatrix}$, $D = \begin{pmatrix} 0 & 0 \\ 0 & 2 \end{pmatrix}$, examine whether it is an orthonormal basis. If your answer is **no**, then use the *Gram-Schmidt Orthogonalization Process* to construct an orthonormal basis out of the one above. (20 pts)