Math 544 | Mar 29, 2001
Linear Algebra
Spring 2001, USC

MIDTERM 2

Time: 75min

1. Use determinants to decide if $\begin{bmatrix} 0 \\ -6 \\ 1 \end{bmatrix}$, $\begin{bmatrix} 0 \\ 4 \\ -2 \end{bmatrix}$, and $\begin{bmatrix} -8 \\ -4 \\ 3 \end{bmatrix}$ are linearly independent.

2. Find a basis for the $Col\,A$ and $Nul\,A$, where $A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 6 & 7 & 8 & 4 \end{bmatrix}$.

3. Find a 3×3 matrix, using homogenous coordinates, which rotates the xy-plane by 90° counterclockwise about the point $(1, 0)$.

4. Find inverse of the matrix $\begin{bmatrix} 1 & 5 & 0 \\ -2 & -7 & 6 \\ 1 & 3 & -4 \end{bmatrix}$ if it exists.

5. True or False: Justify your answers. This means that you should give a proof if the answer is affirmative, or produce a counterexample otherwise.

(a) Let A be an $m \times n$ matrix. Then the linear transformation $T\colon R^n \to R^m$, given by $T(x) = Ax$ is one to one provided that $Rank(A) = n$. (Hint: use the rank theorem).

(b) In R^2 rotations and reflections always commute.

(c) If we rescale the x-axis in R^2 by a factor of 2 and the y-axis by a factor of 3, then the area of every region in R^2 changes by a factor of 6.

(d) If A and P are square matrices with P invertible, then $det(PAP^{-1}) = det A$.

Problems 1 *to* 4 *are worth* 15 *points each, and* 5 *is worth* 40 *points.*