國立臺灣大學101學年度碩士班招生考試試題

1. Let $A=\begin{bmatrix}2 & 3 & 3\\ 0 & 5 & 7\\ 6 & 9 & 9\end{bmatrix}$. (a) Factor A into LU. (b) Find a basis for the row space of A.

   (c) Find a basis for the column space of A. (15%)
2. What is the relation between the rank r and the dimension of $A_{m\times n}$ when the number of solutions to $A\vec{x}=\vec{b}$ is (15%)

   (a) 0 or 1, depending on $\vec{b}$.

   (b) ∞, independent of $\vec{b}$.

   (c) 0 or ∞, depending on $\vec{b}$.

   (d) 1, regardless of $\vec{b}$.
3. Find a basis for the intersection of the subspaces V=Span((1,0,1,1),(2,1,1,2)) and W=Span((0,1,1,0),(2,0,1,2)) $\subset R^4$. (10%)
4. Compute the Gram-Schmidt QR factorization of the matrix (20%)

   $$A=\begin{bmatrix}1 & -2 & -1\\ 2 & 0 & 1\\ 2 & -4 & 2\\ 4 & 0 & 0\end{bmatrix}$$
5. If $a_0=0, a_1=a_2=1$, and $a_{k+1}=2a_k+a_{k-1}-2a_{k-2}$ for k $\geqq$ 2, determine the formula for a_k. (20%)
6. Find the stationary points for the function $f=(x^2-2x)\cos y$ and decide those points are minimum, maximum, or saddle points. (20%)

試題隨卷繳回