Quiz #4 for Math 250:1 & 5

2/23/2011

Name _____ **Section** (please circle one) 1 5

1. (2) Suppose that A is an $m \times n$ matrix. **Define** the *rank of* A and the *nullity of* A.

Suggestion Use complete English sentences. You might want your first sentence to begin with the phrase: "If R is the reduced row echelon form of A, then the ...".

Suppose R is the reduced row echelon form of A, then the rank of A is the number of pivots in R and the nullity of A is $n -$ the rank of A.

Simple examples are better than complicated examples!

2. (2) Give an example of a matrix which has rank = **3** and nullity = **2**. You need not verify your example!

Answer $\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \end{bmatrix}$

3. (2) Give two 2×2 matrices A and B so that the rank of A is **1**, the rank of B is **1**, and the rank of $A + B$ is **2**. You need not verify your example!

Answer $A = \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$ so that $A + B = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$.

4. (2) Give two 2×2 matrices A and B so that the rank of A is **1**, the rank of B is **1**, and the rank of $A + B$ is **1**. You need not verify your example!

Answer $A = \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$ so that $A + B = \begin{bmatrix} 2 & 0 \\ 0 & 0 \end{bmatrix}$.

5. (2) Give two 2×2 matrices A and B so that the rank of A is **1**, the rank of B is **1**, and the rank of $A + B$ is **0**. You need not verify your example!

Answer $A = \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 0 \\ 0 & 0 \end{bmatrix}$ so that $A + B = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$.