August 25, 2010

Math 510 Ungraded Homework 1.1

1. Show rank(A + B) $\leq$ rankA + rankB.

2. (a) Find $\begin{bmatrix} I & 0 \\ X & I \end{bmatrix}^{-1}$.

   (b) If A is nonsingular, show

$$\begin{bmatrix} I & 0 \\ -CA^{-1} & I \end{bmatrix} \begin{bmatrix} A & B \\ C & D \end{bmatrix} = \begin{bmatrix} A & B \\ 0 & D - CA^{-1}B \end{bmatrix}.$$

3. Show that for an matrix A, there exist nonsingular P and Q such that

$$PAQ = \begin{bmatrix} I_r & 0 \\ 0 & 0 \end{bmatrix}$$

   where r = rankA.

4. Prove every vector space has a basis (need not be finite).