3.13. Prove Theorem 3.4.1: If $A$ is a square nonsingular matrix and $A = \begin{bmatrix} A_{11} & A_{12} \\ A_{21} & A_{22} \end{bmatrix}$ where both $A_{11}$ and $A_{22}$ are nonsingular then in terms of the Schur complement of $A_{11}$ in $A$, $Z = A_{22} - A_{21}A_{11}^{-1}A_{12}$, we have the inverse of $A$ is

$$A^{-1} = \begin{bmatrix} A_{11}^{-1} + A_{11}^{-1}A_{12}Z^{-1}A_{21}A_{11}^{-1} & -A_{11}^{-1}A_{12}Z^{-1} \\ -Z^{-1}A_{21}A_{11}^{-1} & Z^{-1} \end{bmatrix}.$$ 

3.8. Prove that a square matrix that is either row or column diagonally dominant is nonsingular.

3.9. Prove that a positive definite matrix is nonsingular.

3.7.A. Prove Theorem 3.7.4: If $A$ and $B$ are orthogonal then the Kronecker product $A \otimes B$ is orthogonal. HINT: Use Theorem 3.2.5 and show $(A \otimes B)^{-1} = A^{-1} \otimes B^{-1}$.  

Write in complete sentences!!! *Explain* what you are doing and convince me that you understand what you are doing and why. Justify all steps by quoting relevant results from the textbook or hypotheses.