Theory of Matrices, MATH 5090, Summer 2018

Homework 5, Section 3.2

Due Friday, June 22 at 1:00

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.

3.3. Prove that for any quadratic form x^TAx there is a symmetric matrix A_s such that $x^TA_sx = x^TAx$. HINT: Let $A_s = \frac{1}{2}(A + A^T)$.

3.4. Give conditions on a, b, and c for the matrix below to be positive definite: $\begin{bmatrix} a & b \\ b & c \end{bmatrix}$. HINT: The answer is $\det(A) > 0$ and $a > 0$.

3.2.A. Prove Theorem 3.2.1 part (4): Let $A = [a_{ij}]$ and $B = [b_{ij}]$ be $n \times n$ matrices. If A and B are diagonal then AB is diagonal. If A and B are upper triangular then AB is upper triangular. If A and B are upper triangular then AB is upper triangular. If A and B are lower triangular then AB is lower triangular.

3.2.B. Prove the third part of Theorem 3.2.3: Row addition, $R_p \to R_p + sR_q$, can be accomplished by multiplication on the left by an elementary matrix which is formed by performing the same row addition on the $n \times n$ identity matrix.