MATH 2371, Homework 3

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Problem 1: Let A be a self-adjoint matrix. Show that if $I < A$ then $I < A^2$.

Problem 2: For two $n \times n$ matrices A, B, their Hadamard product $A \circ B$ is defined as:

$$(A \circ B)_{ij} = A_{ij} B_{ij}.$$

Now let A, B be two $n \times n$ positive matrices. Prove that $A \circ B$ is positive using the notion of Gram matrix.

Problem 3: Give example of two 2×2 matrices A, $B > 0$ such that $AB + BA$ is not positive.

Problem 4: Let A, B be self-adjoint $n \times n$ matrices with $B > 0$. Prove that the eigenvalues of AB are real (note that AB is not necessarily a self-adjoint matrix).