

EE263 homework 8 additional exercise

1. *Some simple matrix inequality counter-examples.*

- (a) Find a (square) matrix A , which has all eigenvalues real and positive, but there is a vector x for which $x^T A x < 0$. (Give A and x , and the eigenvalues of A .)

Moral: You cannot use positivity of the eigenvalues of A as a test for whether $x^T A x \geq 0$ holds for all x .

What is the correct way to check whether $x^T A x \geq 0$ holds for all x ? (You are allowed to find eigenvalues in this process.)

- (b) Find symmetric matrices A and B for which neither $A \geq B$ nor $B \geq A$ holds.

Of course, we'd like the simplest examples in each case.