First name: Sebastian
Last name: Gumpold
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Homework number: 4
Homework Title: Excercise 4.17

Problem description:

If λ is an eigenvalue of an n x n matrix A, show that λ² is an eigenvalue of A².

Problem solution:

We'll use the definition of the eigenvalue and eigenvector to prove this problem.

Results:

If λ is an eigenvalue of A and x is its corresponding eigenvector, the following equation is correct by definition: $A x = \lambda x$. If λ² would be an eigenvalue of A² one can create the according equation $A^2 x = \lambda^2 x$. Now all we have to do is to show that this equation is true:

As $A^2 x = \lambda^2 x$ is the same as $A.A x = \lambda \lambda x$ we can use the first equation ($A x = \lambda x$) to get the following one: $A \lambda x = \lambda A x$, which is the same as $\lambda A x = \lambda A x$ because of commutativity ($k M = M k$, where k denotes a scalar and M a matrix). ■

Discussion and Comments:

none.