Decide if each of these statements is true or false. Give a counterexample for each false statement.

Day 21

1. If λ is an eigenvalue for A, then λ is an eigenvalue for A^t.
2. If λ is an eigenvalue for A, then λ is an eigenvalue for A^*.
3. If λ is an eigenvalue for A, then $\overline{\lambda}$ is an eigenvalue for $\overline{A}$.
4. If $\vec{v}$ is an eigenvector for A, then $\overline{\vec{v}}$ is an eigenvector for $\overline{A}$.
5. If $\vec{v}$ is an eigenvector for A and A is real, then $\vec{v}$ is an eigenvector for A^t.

Day 21

(6) If $\vec{v}$ is an eigenvector for A, then $\vec{v}$ is an eigenvector for A^2.

(7) If $\vec{v}$ is an eigenvector for eigenvalue λ and matrix A, then $\lambda \neq 0$.

(8) If $\vec{v}$ is an eigenvector for A and A is invertible, then $\vec{v}$ is an eigenvector for A^{-1}.

(9) If λ is an eigenvalue for A, then λ is an eigenvalue for A^2.

(10) If 0 is an eigenvalue of A, then A is singular.

(11) If A is singular (and square), then 0 is an eigenvalue of A.

(12) If $\vec{v}$ is an eigenvector for A & B both $n \times n$, then $\vec{v}$ is an eigenvector for AB.

(13) If λ is an eigenvalue for A & B both $n \times n$,
then λ^2 is an eigenvalue for AB.

Day 21

(14) If $\vec{v}$ is an eigenvector for A & B both $n \times n$,
then $\vec{v}$ is an eigenvector for $7A + 4B$.

(15) If λ is an eigenvalue of A & B both $n \times n$,
then 2λ is an eigenvalue of $A+B$.

(16) If A is real and 3×3, then
A has a real eigenvalue.

(17) If $A^2 = I$ and λ is an eigenvalue of A,
then λ is 1 or -1.

(18) If 1 is the only eigenvalue of A,
then $A = I$.

(19) If λ is an eigenvalue for A, ~~then~~
then $\lambda^2 + \lambda - 6$ is an eigenvalue for $(A+3I)(A-2I)$.