Quiz 5 and 6

(1) [14pts]True/False

(a) If Q is symmetric then Q is orthogonal.

(b) If Q is orthogonal then its determinant must be 1.

(c) If a 3x3 matrix A has an eigenvalue with geometric multiplicity 3 then there exists a basis (for $\mathbb{R}^3$) of eigenvectors of A.

(d) An eigenvalue λ can never be equal to 0.

(e) If $\det A = 0$ then 0 is an eigenvalue of A.

(f) If a 3x3 matrix has only 2 distinct eigenvalues, it is not diagonalizable.

(g) If A has determinant 0, it is not diagonalizable.

(2)[5pts] Write down a definition of an **orthogonal matrix**.

(3)[15pts] Find the characteristic polynomial of the matrix below. Also write down the algebraic and geometric multiplicities of the eigenvalue(s).

$$\begin{pmatrix} 1 & 2 & 0 \\ 0 & 1 & 3 \\ 0 & 0 & 1 \end{pmatrix}$$

(4)[6pts] Given that A is diagonalizable. Write down the diagonal matrix D which it is similar to.

$$A = \begin{pmatrix} 1 & 2 \\ 0 & c \end{pmatrix}$$