Step-1

(a) If A is symmetric matrix then $A^T = A$

We know that the row space is the orthogonal complement of the null space.

On the other hand, for a symmetric matrix, the row space and the column space are one and the same.

Putting these observations together, we can say that the orthogonal complement of column space is null space of the symmetric matrix.

Or simply, the column space is perpendicular to the null space of a symmetric matrix.

Step-2

(b) While A is a symmetric matrix and so, the row space is equal to the column space.

We can write $Ax = 0$ as $Ax = 0x$ and also, $Az = 5z$.

So, the eigen values of A are 0 and 5 and the respective eigen vectors are x, z.

The eigen vector z is in the column space implies z is in the row space also.

Consequently, it must be orthogonal to all the vectors in the null space.

Since $Ax = 0$ holds for $x\hat{A}$, we follow that x is in the null space.

Therefore, $z^T x$ must be zero.