Euclidean and Hermition Spaces

LA4⋄1. There are three such vectors in the Euclidean space $\mathbb{R}^3$ that all their pairwise inner products are non-negative. Does there always exist such orthonormal basis in $\mathbb{R}^3$ that all these three vectors lie in one coordinate octant?

LA4⋄2. Two vectors in the Euclidean space lie on the one side of the given hyperplane. The angle between these vectors is obtuse. Is it true that the angle between their orthogonal projections on this hyperplane is also obtuse?

LA4⋄3. Find the maximum number of vectors that can be released from a given point in the Euclidean space $\mathbb{R}^n$ so that all the pairwise angles between them are obtuse?

LA4⋄4. Give an example of an operator A on some Euclidean (or Hermition) vector space such that it has an invariant subspace U and $A(U^{\perp}) \not\subset U^{\perp}$.

LA4⋄5. Suppose $I^n = \{x \in \mathbb{R}^n \mid x_j \leq 1 \forall j\}$ is a standart n-dimensional cube. How much

(a) k-dimensional faces

(b) inner diagonals (between vertices which are symmetric to each other with respect to the center of cube)

(c) hyperplanes of symmetries

it has?

LA4⋄6. Find in I^n
(1) a length of inner diagonal and its limit by $n \to \infty$,
(2) angles between inner diagonals and edges of cube (and their limits).