1. Let G be a compact Lie group, and T a maximal torus. The inclusion of T into G induces a map on the cohomology of their classifying spaces $f : H^*(BG) \longrightarrow H^*(BT)$. Since the action of the Weyl group W is homotopically trivial on BG, the image of f lies in the W-invariant subgroup of $H^*(BT)$. The question is, when does f give an isomorphism between $H^*(BG)$ and $H^*(BK)^W$? (ie, conditions on G and the coefficient group.)

2. Let T be a unitary operator on a complex Hilbert space H with no eigenvectors. Fix $v \in H$. Define a function $f_n : S^1 \longrightarrow H$ by

$$f_n(\theta) = \frac{1}{n} \sum_{k=1}^{n} e^{ik\theta} T^k(v).$$

   Show that f_n converge uniformly to the zero function.

3. Let $\{T_\alpha\}_{\alpha \in A}$ be a family of commuting diagonalisable endomorphisms of a vector space V. Can they be simultaneously diagonalised?

4. Let X be a Hausdorff topological space and suppose a and b are distinct points of X. Do there exist open neighbourhoods A and B of a and b respectively such that $\overline{A} \cap \overline{B} = \emptyset$.

5. For which topological spaces X is the Banach space of continuous functions on X separable?