Be able to do the following.

(1) State basic definitions.
(2) Identify a surface from a triangulation or information about the Euler characteristic.
(3) Find the homology groups of a complex or surface.
(4) Deduce facts about a vector field using the Poincare index, winding numbers and the type of surface.
(5) Algebraically manipulate chains on a grating.
(6) Let $f : D \to R$ be a function between subsets of the plane. Recall the following definitions.
    - (CU) f is continuous in the usual sense if $\forall\ p \in D$ and $\epsilon > 0\ \exists$ $\delta > 0$ such that $\forall q \in D$ we have $||p-q|| < \delta \implies ||f(p)-f(q)|| < \epsilon$.
    - (CH) f is continuous in Henle's sense if $\forall\ p \in D$ and $A \subset D$ we have $p \leftarrow A \implies f(p) \leftarrow F(A)$.

    Prove these are equivalent.
(7) Consider a triangulated polygon in the plane with vertices labels A, B and C in any manner. Let $\mathcal{C}$, the *content*, be the number of complete triangle, those with all three labels, counted by orientation. Let $\mathcal{I}$, the *index*, be the number of exterior edges labeled AB counted by orientation. Then $\mathcal{C} = \mathcal{I}$.
(8) Let $\mathcal{D}$ be a closed disk in the plane with boundary the closed path γ. If a continuous vector field $V(x, y)$ is never zero on $\mathcal{D}$, then the winding number of γ with respect to V is zero.
(9) Any complex on the 2-sphere can be colored with 6 or fewer colors.
(10) Let G be an open set in the plane. Then G is connected if and only if for every pair of points a and b in G there is a polygonal chain λ with end points a and b.
(11) Let A and B be disjoint compact subsets of the plane. Then $\exists\ \epsilon > 0$ such that $\forall\ a \in A$ and $b \in B$ we have $||a - b|| > \epsilon$.
(12) Prove the Brower fixed point theorem.