

## HOMEWORK #5

1. Show how Proposition 3.19 is implied by the finite dimensional case.
2. Show that in any cohomology theory  $h^*$  satisfying the axioms, there is a Mayer-Vietoris long exact sequence

$$\cdots \rightarrow h^n(X) \rightarrow h^n(A) \oplus h^n(B) \rightarrow h^n(A \cap B) \rightarrow h^{n+1}(X) \rightarrow \cdots$$

whenever  $X$  is a CW complex which is a union of two subcomplexes  $A$  and  $B$ . (See section 2.3 for how this goes in axiomatic homology.)

3. Compute the homology and (integral) cohomology groups of  $\mathbb{R}P^3 \times \mathbb{R}P^3$  (using a product cell structure for instance — see 3.B for the boundary map on the cellular chain complex of a product.). Use the cohomology of  $\mathbb{R}P^3 \times \mathbb{R}P^3$  to show that the hypothesis of freeness in the Künneth formula is necessary.
4. Hatcher 3.3.7
5. Hatcher 3.3.10