

## HOMEWORK 5

**Exercise 1.** Prove that on  $S^n$  there is a nonzero (continuous) vector field if and only if  $n$  is odd.

**Exercise 2.** Using CW-structure of the Klein bottle and the projective plane compute their homology groups.

**Exercise 3.** Let  $X = D^{n+1} \cup_f S^n$ , where  $f : \partial D^{n+1} = S^n \rightarrow S^n$  has degree  $k$ . Compute homology groups of  $X$  and also the homomorphism

$$p_* : H_i(X) \rightarrow H_i(X/S^n)$$

induced by the projection  $p : X \rightarrow X/S^n$ .