

**Question 1:**

Consider the cycle  $a$  given by the inclusion  $\partial\Delta^2 \rightarrow \Delta^2$ , and let  $b$  be its barycentric subdivision. Show explicitly that  $a$  and  $b$  differ by a relative boundary, i.e. write an element  $c \in \Delta_2(\Delta^2)$  such that  $\partial c - (a - b) \in \Delta_2(\partial\Delta^2)$ . You can present a solution by pictures.

**Question 2:**

Let  $X$  be a topological space and  $Y$  be a subspace of  $X$ . Let  $i: Y \rightarrow X$  be the inclusion. Let  $C$  be space obtained from  $X$  by "attaching a cone on  $Y$ ". More precisely, is the topological space

$$C = (Y \times [0, 1]) \sqcup X / \sim$$

where  $\sim$  is defined as  $(y, 0) \sim i(y)$  and  $(y, 1) \sim (y', 1)$  for all  $y, y' \in Y$ . Compute  $H_*(C)$ .

**Question 3:**

Show that homotopy equivalence of chain complexes is an equivalence relation.