

**Spring 2021, Math 621: Preliminary Problem Set 9**  
**Due: Thursday, April 8th, 2021**  
**Simplicial and Singular Homology**

**Preliminary problems.** These should be submitted to Gradescope before Thursday discussion.

(P1) Consider the complexes

$$C_{\bullet} : \quad 0 \longrightarrow \mathbb{Z} \xrightarrow{\text{Id}} \mathbb{Z} \longrightarrow 0$$

and

$$D_{\bullet} : \quad 0 \longrightarrow \mathbb{Z} \xrightarrow{0} \mathbb{Z} \longrightarrow 0.$$

(a) Locate 2 different morphism  $C_{\bullet} \rightarrow D_{\bullet}$  of complexes (you are encouraged to be creative).

(b) Locate a pair of group homomorphisms  $f, g : \mathbb{Z} \rightarrow \mathbb{Z}$  so that

$$\begin{array}{ccccccc} C_{\bullet} : & 0 & \longrightarrow & \mathbb{Z} & \xrightarrow{\text{Id}} & \mathbb{Z} & \longrightarrow 0 \\ & & & \downarrow f & & \downarrow g & \\ D_{\bullet} : & 0 & \longrightarrow & \mathbb{Z} & \xrightarrow{0} & \mathbb{Z} & \longrightarrow 0. \end{array}$$

is **not** a morphism of complexes.