1. Prove the unproved proposition from Lecture 2. Note that you need to show that a is well-defined.

2. Check that the homotopy category of based spaces, as defined in class, is indeed a category.

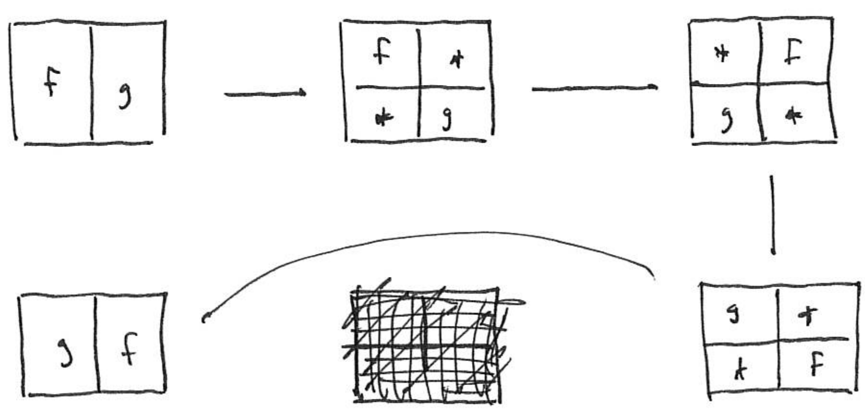
3. Prove that if C is an H-cogroup then the coinverse and comultiplication maps induce a natural group structure on $[C,X]_*$ for any based (X,x).

4. Prove that ΩX and $S^1 \wedge X$ are indeed H-groups and H-cogroups for based X.

5. Show that $X \wedge (Y \wedge Z)$ is naturally homeomorphic to $(X \wedge Y) \wedge Z$ if X and Z are locally compact and Hausdorff.

6. Prove that $(\mathbb{Q} \wedge \mathbb{Q}) \wedge \mathbb{N}$ is not homeomorphic to $\mathbb{Q} \wedge (\mathbb{Q} \wedge \mathbb{N})$.

7. Make precise the "pictorial proof" that $S^2 \wedge X$ is a homotopy cocommutative H-cogroup and $\Omega^2 X$ is a homotopy commutative H-group:



8. (Hatcher, Exercise 4.1.1.)

9. Prove that $GL_n(\mathbb{R})$ with matrix multiplication and inverse of matrices is an H-group.