MATH 231BR: ADVANCED ALGEBRAIC TOPOLOGY
HOMEWORK 7
DUE: TUESDAY, APRIL 5 AT 12:00AM (MIDNIGHT) ON CANVAS

In the below, I use LAT to refer to Miller's *Lectures on Algebraic Topology*, available at: `https://math.mit.edu/~hrm/papers/lectures-905-906.pdf`.

1. Problem 1: What are the possible homologies? (25 points)

Suppose that $F_\bullet C$ is filtered complex of abelian groups which is first-quadrant. Assume that the associated spectral sequence $(E^r_{*,*}, d^r)$ has E^2-term given by $E^2_{s,t} = \mathbb{Z}/2\mathbb{Z}$ if $(s,t) = (0,0), (0,4), (2,3), (3,2), (6,0)$ and $E^2_{s,t} = 0$ otherwise.

(a) Determine all possible values of $H_*(C)$.
(b) Assume further that $F_\bullet C$ is a filtered complex of $\mathbb{F}_2$-vector spaces. How does this restrict the possible values of $H_*(C)$?

2. Problem 2: Universal coefficients spectral sequence (25 points)

Do Exercise 66.1 of LAT.