

## MTH 707 Topology I, Fall 19, HW7

- (1) A sequence of abelian groups and homomorphisms is *exact* if the image of one map is the kernel of the next. (i.e. a chain with trivial homology).

For each of the following exact sequences of abelian groups and homomorphisms, say as much as you can about the unknown group  $G$ , and/or the unknown homomorphism  $\alpha$ .

(a)  $0 \rightarrow \mathbb{Z}/2 \rightarrow G \rightarrow \mathbb{Z} \rightarrow 0$

(b)  $0 \rightarrow \mathbb{Z} \rightarrow G \rightarrow \mathbb{Z}/2 \rightarrow 0$

(c)  $0 \rightarrow \mathbb{Z} \xrightarrow{\alpha} \mathbb{Z} \oplus \mathbb{Z} \rightarrow \mathbb{Z} \oplus \mathbb{Z}/2 \rightarrow 0$

(d)  $0 \rightarrow G \xrightarrow{\alpha} \mathbb{Z} \oplus \mathbb{Z} \rightarrow \mathbb{Z}/2 \rightarrow 0$

(e)  $0 \rightarrow \mathbb{Z}/3 \rightarrow G \rightarrow \mathbb{Z}/2 \rightarrow \mathbb{Z} \xrightarrow{\alpha} \mathbb{Z} \rightarrow 0$

- (2) Hatcher p131 Section 2.1 Q4, 5, 14.