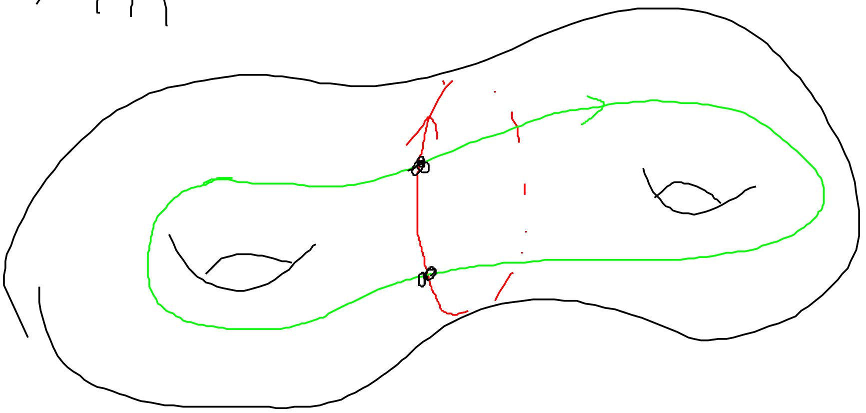
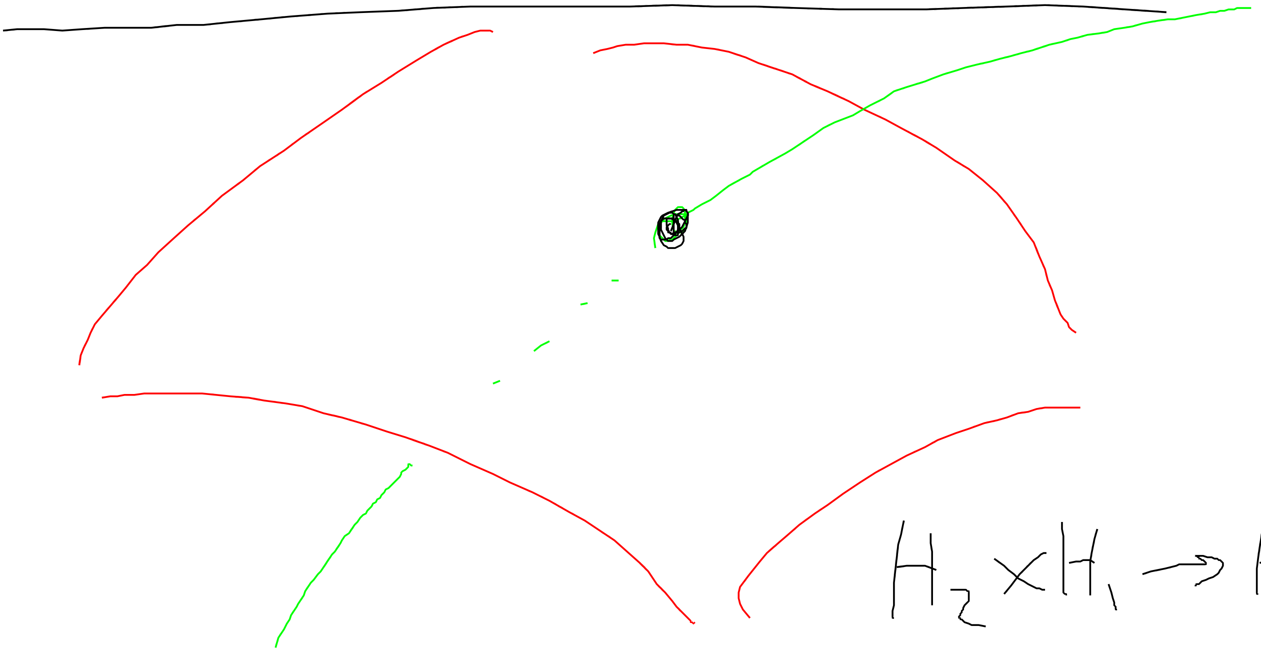
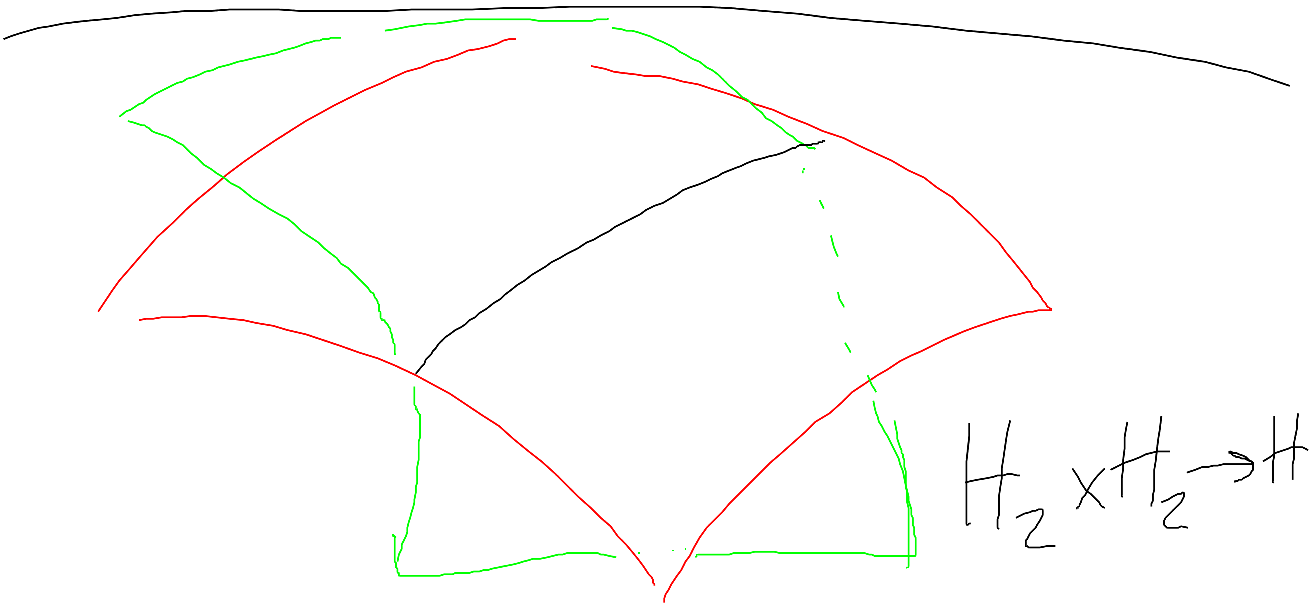
$H_1 \times H_1 \longrightarrow H_0$





$H_2 \times H_1 \to H_0$



$H_2 \times H_2 \to H_1$

$$\mathrm{Hom}(A, B)$$

$$A \pitchfork B$$

$$A' \to A \to A'' \to 0$$

$$0 \to A'' \pitchfork B \to A \pitchfork B \to A' \pitchfork B$$

$$(A \otimes B) \pitchfork C \cong A \pitchfork (B \pitchfork C)$$

$$C_{k+1} \xrightarrow{\partial_{k+1}} C_k \xrightarrow{\partial_k} C_{k-1}$$

$$g\partial_{k+1} : C_{k+1} \to G \longmapsfrom g : C_k \to G$$

$$\mathrm{Hom}(C_{k+1}, G) \leftarrow \mathrm{Hom}(C_k, G) \leftarrow \mathrm{Hom}(C_{k-1}, G)$$

$$f\partial_k : C_k \to G \longmapsfrom f : C_{k-1} \to G$$

$$0 \longrightarrow \mathbb{Z} \xrightarrow{\alpha} \mathbb{Z}\oplus\mathbb{Z} \xrightarrow{\beta} \mathbb{Z}\oplus\mathbb{Z}_k \longrightarrow 0$$

$$q \longmapsto (0,kq) \qquad (p,q) \longmapsto (p,\bar{q})$$

$$\mathrm{Hom}(\mathbb{Z},\mathbb{Z}) \qquad \mathrm{Hom}(\mathbb{Z}\oplus\mathbb{Z},\mathbb{Z}) \qquad \mathrm{Hom}(\mathbb{Z}\oplus\mathbb{Z}_k,\mathbb{Z})$$

$$f'(q)=hq \mapsto h \qquad \cong \mathbb{Z}$$

$$f'(p,q)=hp+h'q \mapsto (h,h') \qquad \cong \mathbb{Z}\oplus\mathbb{Z}$$

$$f(p,\bar{q})=hp \mapsto h \qquad \cong \mathbb{Z}$$

$$(f\beta)(p,q)=hp \longleftarrow\!\!\shortmid\; f(p,\bar{q})=hp$$

$$(f\beta)(p,q)=hp \mapsto (h,0) \qquad f(p,\bar{q})=hp \mapsto h$$

$$\mathrm{Hom}(\mathbb{Z},\mathbb{Z}) \longleftarrow \mathrm{Hom}(\mathbb{Z}\oplus\mathbb{Z},\mathbb{Z}) \longleftarrow \mathrm{Hom}(\mathbb{Z}\oplus\mathbb{Z}_k,\mathbb{Z}) \leftarrow 0$$

$$(f'\alpha)(q) = f'(0,q) = h'kq \longleftarrow\!\!\shortmid\; f'(p,q)=hp+h'q$$

$$(f'\alpha)(q) = h'kq \mapsto h'k \qquad f'(p,q)=hp+h'q \mapsto (h,h')$$

$$(h,\alpha) \longleftarrow\!\!\shortmid h$$

$$0 \leftarrow \mathbb{Z}/k\mathbb{Z} \xleftarrow{\ell k} \mathbb{Z} \leftarrow \mathbb{Z}\oplus\mathbb{Z} \leftarrow \mathbb{Z} \leftarrow 0$$

$$h'k \longleftarrow\!\!\shortmid (h,h')$$

$$\mathbb{Z}/k\mathbb{Z} = \operatorname{Coker}(\operatorname{Hom}(\alpha, 1_{\mathbb{Z}})) \qquad k\mathbb{Z} = \operatorname{Im}(\operatorname{Hom}(\alpha, 1_{\mathbb{Z}}))$$