HW 3, please submit on Oct. 30

Social event: Meet with your group to watch the long Thurston movie "Outside in" on line. Try to understand how $S^2 \overset{i_0}{\hookrightarrow} \mathbb{R}^3$ are regularly homotopic.

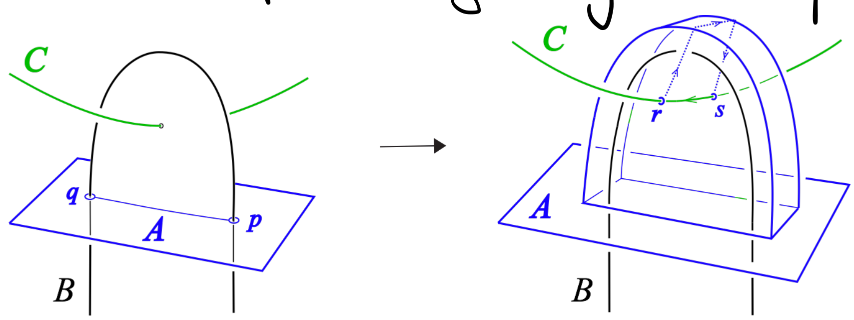
reflect $\searrow$ $S^2 \nearrow i_0$

(1) Given an immersion $f: S^2 \looparrowright \mathbb{R}^3$, we associate the normal Gauß-map $G(f): S^2 \longrightarrow S^2$, $x \longmapsto$ unit normal vector at $df_x(TS^2) \subseteq \mathbb{R}^3$

(a) Show $\deg\big(G(f)\big) = \pm 1$.

(b) Show that this implies by Smale that f is regularly homotopic to i_0!

(2)



(a) Discuss how the above pictures both give three embedded disks A, B, C in $D^4 \cong D^3 \times D^1$ with their boundary in ∂D^4. Show that the link $(\partial A, \partial B, \partial C)$ is isotopic to the Borromean rings.

(b) Describe the intersections of A, B, C in both pictures and identify Whitney disks in both pictures.