Dehn Surgery and 3-Manifolds Exercise Set #2

Exercise 1: Given two slopes α_1, α_2 in $\mathbb{Q} \cup \{1/0\}$. Define $\Delta(\alpha_1, \alpha_2)$ to be the minimum geometric intersection number of curves representing those slopes on the torus. Show that $\Delta(m/l, m'/l') = |ml' - m'l|$.

Exercise 2: Show that, $S^3_{m/l}(K)$ only depends on m/l (up to orientation-preserving homeomorphism).

Exercise 3: Show that $H_1(S^3_{m/l}(K)) \cong \mathbb{Z}/|m|\mathbb{Z}$.

Exercise 4: Show that $\pi_1(S^3_{-1}(RHT)) = \langle x, z : (xz)^2 = z^3 = x^7 \rangle$.

Exercise 5: Show that the manifold defined by the following surgery diagram below is $S^1 \times S^2$.

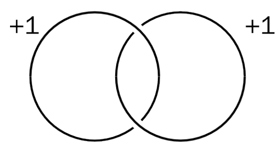

Figure 1: $S^1 \times S^2$?

Exercise 6: Show that the manifold below is the Poincaré homology sphere.

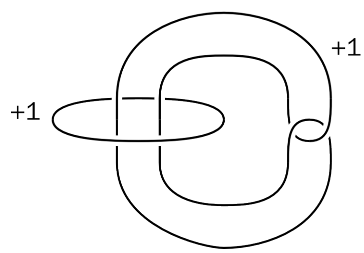

Figure 2: $S^1 \times S^2$?

Exercise 7: Show that +5 surgery on the RHT is a lens space.

Exercise 8: Show that +6 surgery on the RHT is $L(2,1)\#L(3,1)$.