

MATH 636 SPRING 2024
HOMEWORK 9
DUE JUNE 3, 2024
INSTRUCTOR: ROBERT LIPSHITZ

Required problems:

- (0) Recall that $SO(3) \cong \mathbb{R}P^3$. Compute $\pi_i(SO(3))$ and $\pi_i(SO(4))$ for $i \leq 3$. Similarly, use the fact that $SU(2) \cong S^3$ to compute $\pi_i(SU(2))$ for $i \leq 5$, $\pi_i(SU(3))$ for $i \leq 3$, and prove $\pi_5(SU(3))$ is nontrivial. (You may take as given the stable homotopy groups of spheres listed in Hatcher, but be careful about what the stable range is.)
- (0) Hatcher 4.3.3 (p. 419).
- (0) Hatcher 4.3.5 (p. 419).
- (0) Hatcher 4.3.6 (p. 419). (I think the last sentence means “show that if μ' is another H -space multiplication on $K(G, n)$ then μ' is homotopic to μ as maps $K(G, n) \times K(G, n) \rightarrow K(G, n)$.” Also, note that this problem changed between the first printing of the book and the current version; do the current version.)

Optional problems:

Some good qual-level problems:

- Hatcher 4.3.1, 4.3.4, 4.3.5, 4.3.7.

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