MATH 636 SPRING 2024
HOMEWORK 9
DUE JUNE 3, 2024

INSTRUCTOR: ROBERT LIPSHITZ

Required problems:

(1) 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.)
(2) Hatcher 4.3.3 (p. 419).
(3) Hatcher 4.3.5 (p. 419).
(4) 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 $K(G,n) \times K(G,n) \to K(G,n)$." 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.

Email address: lipshitz@uoregon.edu