Geom/Top: Homework 5 (due Monday, 11/19/12)

1. Read Farb notes.
2. Read along in Hatcher.

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1. Hatcher, Section 3.2, Problems 3, 12, 15 (compute the Poincaré series of $S^n, \mathbf{RP}^n, \mathbf{RP}^\infty$ only).
2. Compute the cohomology ring of $\mathbf{RP}^2 \times \mathbf{RP}^2$.
3. Prove that the Klein bottle and the space $X = \mathbf{RP}^2 \vee S^1$ have isomorphic cohomomology rings with $\mathbf{Z}$ coefficients, but not with $\mathbf{Z}/2\mathbf{Z}$ coefficients.
4. Let $L_1 \subset S^3$ be the union of two disjoint round circles that link each other once. Let L_2 be the union of two disjoint , unlinked round circles . Prove that $S^3 - L_1$ and $S^3 - L_2$ has isomorphic integral cohomology groups, but not isomorphic cohomology rings.