

TOPOLOGY MAT 530 HOMEWORK 8

1. Let X be the union of a 2-sphere and a circle that touches this sphere at one point. Compute the fundamental group of X .
2. Compute the fundamental groups of the complex projective spaces $\mathbb{C}P^n$.
3. Compute the fundamental groups of the following graphs:

4. Compute the fundamental group of the set in \mathbb{R}^3 given by the equation $x^3 - 5xy^2 + x^2y - 19y^3 = 0$.

5. Compute the fundamental group of a plane with n punctures (= a 2-sphere with $n + 1$ punctures). *Hint:* prove that this space is homotopy equivalent to a bouquet of n circles.

6. Compute the fundamental group of a punctured torus (a torus with 1 puncture).