Introduction to algebraic topology, Spring 2013

Quiz 1

Name: _____

1. Mark the squares that are followed by correct statements.

☐ Two-sphere S^2 admits a triangulation.

☐ Pair $([0,1],\{0,1\})$ has the homotopy extension property.

☐ Any finite graph is homotopy equivalent to a finite bouquiet of circles.

☐ Equatorial circle is a retract of S^2.

☐ Complement of finitely many points in $\mathbb{R}^2$ is path-connected.

☐ Projective space $\mathbb{RP}^n$ is contractible.

☐ Any graph without cycles has the trivial fundamental group.

☐ A simply-connected CW-complex is homotopy equivalent to a CW-complex with a single 0-cell and no 1-cells.

☐ If two spaces are homotopy equivalent, they are homeomorphic.

☐ The quotient map $S^2 \longrightarrow \mathbb{RP}^2$ is a covering map.

2. In the list of topological spaces below, circle those with abelian fundamental group.

$\mathbb{R}^3$ $\quad$ $S^1 \times [0,1]$ $\quad$ D^3 $\quad$ Möbius band

$S^1 \times \mathbb{RP}^3$ $\quad$ $S^1 \vee S^2$ $\quad$ $S^1 \vee S^1 \vee S^1$ $\quad$ $\mathbb{RP}^2 \vee \mathbb{RP}^2$

Extra credit:

I. Determine the fundamental group of the 1-skeleton of (a) a 3-simplex, (b) a 4-simplex.