HOMEWORK #3

Calculate the fundamental group of the spaces below:
(1) The complement in $\mathbb{R}^3$ of a line and a circle. Note: There are two cases to consider, one where the line goes through the interior of the circle and the other where it doesn't. Are these two spaces homotopy equivalent?
(2) The complement in $\mathbb{R}^3$ of a line and a point not on the line.
(3) $\mathbb{R}^3$ minus two disjoint lines.
(4) $T^2 \setminus \{x, y\}$, where x, y are two distinct points on the 2-torus T^2.
(5) Klein bottle K. Are the torus and the Klein bottle homotopy equivalent?
(6) real projective plane $\mathbb{R}P^2$.