

Tutorial Sheet 9, Topology 2013

1. Describe the homomorphism h_* that is induced for each of the following continuous functions on the circle S^1 :

(a) $h(e^{i\theta}) = e^{i(\theta+\pi)}$, $\theta \in [0, 2\pi]$

(b)

$$h(e^{i\theta}) = \begin{cases} e^{i\theta} & \text{if } \theta \in [0, \pi] \\ e^{i(2\pi-\theta)} & \text{if } \theta \in [\pi, 2\pi] \end{cases}$$

2. Compute the fundamental groups of the following spaces:

(a) A cylinder: $\pi_1(S^1 \times J, x_0)$ where J is any interval in \mathbb{R} and $x_0 = (y_0, z_0) \in S^1 \times J$ is any point.

(b) The punctured plane: $\pi_1(\mathbb{R}^2 \setminus \{(0, 0)\}, x_0)$, for any point $x_0 \in \mathbb{R}^2 \setminus \{0\}$.

(c) A punctured disk: $\pi_1(B^2 \setminus \{0\}, x_0)$, for any point $x_0 \in B^2 \setminus \{0\}$.