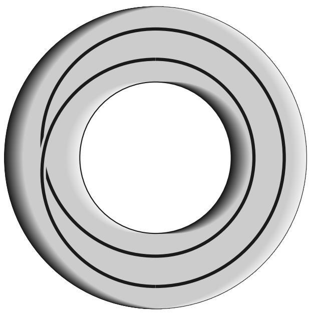
Direct limit

Naloga 6.1 *Let* $G_n = \mathbb{Z}$ *for all* $n \in \mathbb{N}$ *and let* $\varphi_{n,n+1}, \psi_{n,n+1}, \rho_{n,n+1} \colon G_n \to G_{n+1}$ *be defined by* $\varphi_{n,n+1}(x) = 0$, $\psi_{n,n+1}(x) = 2x$ *and* $\rho_{n,n+1}(x) = (n+1)x$. *Find* $\varinjlim(G_n, \varphi_{n,n+1})$, $\varinjlim(G_n, \psi_{n,n+1})$ *in* $\varinjlim(G_n, \rho_{n,n+1})$.

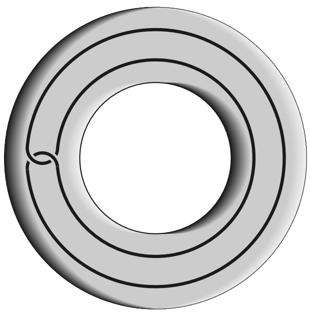
Naloga 6.2 *Let* $x_0 \in X_0 \subset X_1 \subset \ldots X$ *be a sequence of subspaces and let* $X = \cup_{n=1}^{\infty} X_n$. *For* $n < m$ *let* $i^{n,m} \colon X_n \hookrightarrow X_m$ *and* $i^n \colon X_n \hookrightarrow X$. *If for every compact set* $K \subset X$ *exists* $n \in \mathbb{N}$ *such that* $K \subset X_n$, *then* $\pi_1(X)$ *together with homeomorphisms* $i^n_{\#} \colon \pi_1(X_n) \to \pi_1(X)$ *is the direct limit.*

Naloga 6.3 *Let* $T_0 \subset \mathbb{R}^3$ *be a torus and* $f \colon \mathbb{R}^3 \to \mathbb{R}^3$ *be homeomorphism such that* $f(T_0) \subset \operatorname{Int} T_0$ *is as it is shown on the picture.*



Let $T_{n+1} = f(T_n)$ *and let* $T = \cap_{n=1}^{\infty} T_n$. *The space* T *is called* ***diadic solenoid***. *Find* $\pi_1(\mathbb{R}^3 - T)$.

Naloga 6.4 *Let* $T_0 \subset \mathbb{R}^3$ *be a torus and let* $f \colon \mathbb{R}^3 \to \mathbb{R}^3$ *be a homeomorphism such that* $f(T_0) \subset \operatorname{Int} T_0$ *is Whitehead link as it is shown on the picture.*



Let $T_{n+1} = f(T_n)$. *The intersection* $T = \cap_{n=1}^{\infty} T_n$ *is called* ***Whitehead continua***. *Find* $\pi_1(\mathbb{R}^3 - T)$.