

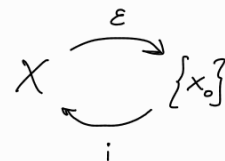
④ X sp top contraibile $\Leftrightarrow id_X \sim \varepsilon$

X contraibile sse $X \sim \{x_0\}$

$X \sim \{x_0\} \Leftrightarrow \exists \pi: X \rightarrow \{x_0\}, i: \{x_0\} \rightarrow X \mid \pi \circ i \sim id_{\{x_0\}} \wedge i \circ \pi \sim id_X$

$$\pi: X \rightarrow \{x_0\} \\ x \mapsto x_0$$

$$i: \{x_0\} \rightarrow X \\ x_0 \mapsto x_0$$



X contraibile $\Rightarrow X \sim \{x_0\}$

$\Rightarrow \exists \pi: X \rightarrow \{x_0\}, i: \{x_0\} \rightarrow X \mid \pi \circ i \sim id_{\{x_0\}} \wedge i \circ \pi \sim id_X$

$\Rightarrow \exists F: X \times I \rightarrow X \mid \begin{cases} F(x, 0) = id_X(x) \\ F(x, 1) = (i \circ \pi)(x) \end{cases} \quad \forall x \in X$

ma $i \circ \pi = \varepsilon$ costante $\varepsilon: X \rightarrow X$
 $x \mapsto x_0$

$\Rightarrow id_X \sim \varepsilon$

$id_X \sim \varepsilon \Rightarrow \exists F: X \times I \rightarrow X \mid \begin{cases} F(x, 0) = id_X(x) = x \\ F(x, 1) = \varepsilon(x) = x_0 \end{cases} \quad \forall x \in X$

$\Rightarrow \varepsilon = i \circ \pi$ definite sopra $\mid \pi \circ i \sim id_{\{x_0\}} \wedge i \circ \pi \sim id_X$

$\Rightarrow X \sim \{x_0\}$

$\Rightarrow X$ contraibile