<u>Non-example</u> 

<u>not</u> isomorphic even though both S^1.

<u>Remark</u> ⊛ implies that f preserves the covering space structure, i.e. it takes $p_1^{-1}(x)$ to $p_2^{-1}(x)$ for each $x \in X$.

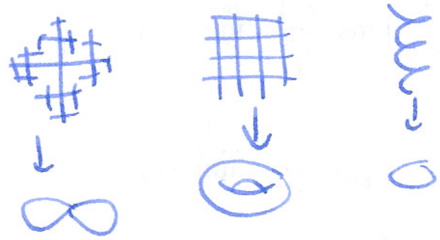
<u>Example</u> $F_2 = \pi_1(S^1 \vee S^1)$ $X =$ 

cover 

subgp $\langle a \rangle$ $\langle b \rangle$ $\langle bab^{-1} \rangle$

<u>Construction of the universal cover</u> $p : \tilde{X} \to X$ s.t. $p_*(\pi_1 \tilde{X})$ is trivial.

<u>Examples</u>



<u>Thm</u> X path connected, locally path connected, semi-locally simply connected, ⊛ then there is a simply connected cover $p : \tilde{X} \to X$.

<u>Defn</u> $\tilde{X} = \{ [\gamma] \mid \gamma \text{ is a path in } X \text{ starting at } x_0 \}$.

<u>Remark</u> define $p : \tilde{X} \to X$ by $[\gamma] \mapsto \gamma(1)$

X path connected $\Rightarrow$ p surjective.

need a topology on $\tilde{X}$: <u>key point</u> : Let $\mathcal{U}$ be the collection of path connected open sets $U \subset X$ s.t. $\pi_1 U \to \pi_1 X$ is trivial. Then $\mathcal{U}$ is a basis for the topology on X if X is ⊛

Let $U_{[\gamma]} = \{ [\gamma \cdot \eta] \mid \eta \text{ is a path in } U \text{ with } \eta(0) = \gamma(1) \}$

$p : U_{[\gamma]} \to U$
- surjective as U path connected
- injective as $\pi_1 U \to \pi_1 X$ trivial.