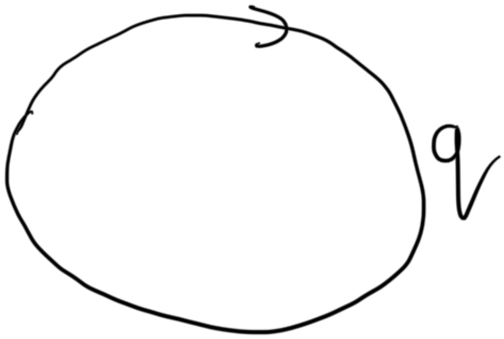
Th 13.1 $W = 1 \iff$

Δ - reduced

$\varphi(q) = W$

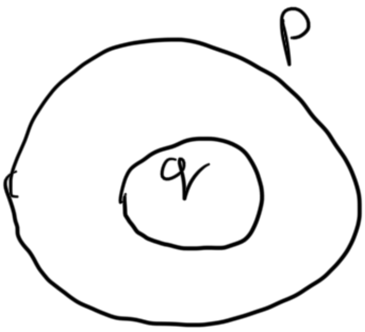


Th 13.2 V, W - conjugate in $G \iff$

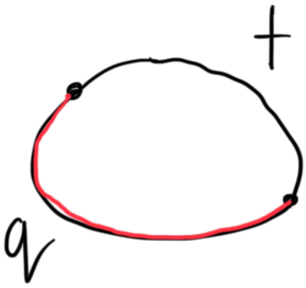
Δ - reduced

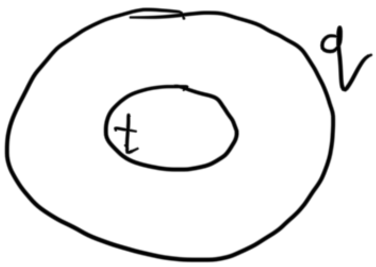
$\varphi(p) = V$

$\varphi(q) = W^{-1}$



Th 7.1 I Δ - circular II Δ - annular A-map





q - smooth section $\iff \bar{\beta}|q| \leq |t|$

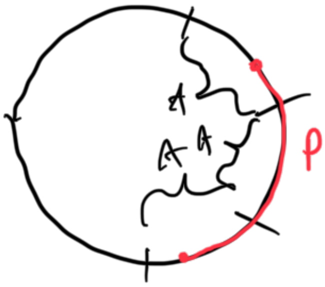
L 19.4 Δ - reduced diagram $r(\Delta) = i+1$

Δ is an A-map

L 19.5 Δ - reduced diagram $r(\Delta) = i+1$

$\varphi(p)$ - A-periodic, A-simple in rank $i+1$

p - smooth



Lem 18.3 $X \overset{i}{\neq} 1$, X - fin. ord in rank i
$\Rightarrow X \overset{i}{\sim} A^m$, A - period in rank $k \le i$.

Proof

18.1 $\Rightarrow X \overset{i}{\sim} A^m$, for either A - period in rank $k \le i$
or A - simple in rank i.

For some $s \neq 0$ $A^s \overset{i}{=} 1$.

13.1 $\Rightarrow \Delta$ 

$\varphi(q) = A^s$

19.4 $\Rightarrow \Delta$ is an A - map

19.5 $\Rightarrow q$ is a smooth section

17.1 $\Rightarrow \bar{\beta}|q| \le 0$

L 18.4 A, B - simple in rank i
$A \overset{i}{\sim} B^l$ then $l = \pm 1$

A-simple $\Rightarrow |A| \le |B|$

13.2 $\Rightarrow$ 

$\varphi(p) \equiv A$
$\varphi(q) \equiv B^{-l}$

19.5 p, q - smooth sections

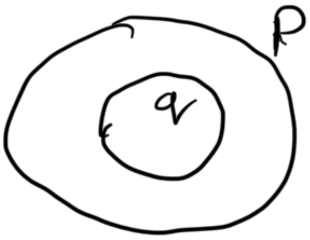
19.4 Δ is an A-map

$17.1. \Rightarrow \bar{\beta}|B'| \le |A| \qquad |L|\bar{\beta}|B| < |A|$

for $|L| \ge 2$ contradiction $\quad 2\bar{\beta} = 2 - 2\beta > 1$

18.5 $X \overset{i}{\sim} Y \Rightarrow \exists Z$ s.t. $X \overset{i}{=} ZYZ^{-1}$, $|Z| \le \bar{\alpha}(|X| + |Y|)$

13.2 $\Rightarrow$



$\varphi(p) \equiv X$

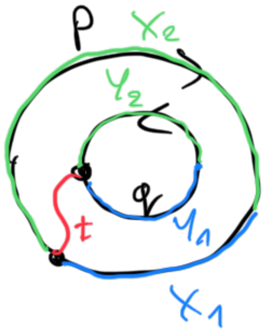
$\varphi(q) \equiv Y^{-1}$

19.4 Δ is an A-map

Any loop consisting of 0-edges is contractible to the point

By L.17.1

Δ

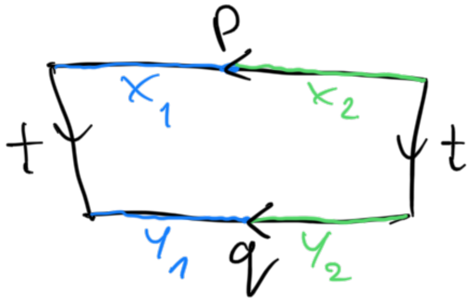


$|t| \le \gamma(|X| + |Y|)$

$X = X_1 X_2$

$Y = Y_1 Y_2$

Δ'



By 13.1

$X_2 X_1 \overset{i}{=} T Y_2 Y_1 T^{-1}$

if $|X_1| \le \frac{1}{2}|X|$ and $|Y_2| \le \frac{1}{2}|Y|$

$X = X_1 X_2 = X_1 X_2 X_1 X_1^{-1} \overset{i}{=} X_1 T Y_2 Y_1 T^{-1} X_1^{-1} =$

$= \underbrace{(X_1 T Y_2)}_{Z} Y_1 Y_2 (Y_2^{-1} T^{-1} X_1^{-1})$

$|Z| \le \left(\frac{1}{2}|X| + \frac{1}{2}|Y| + \gamma(|X| + |Y|)\right)$

Lem 18.2 $G(i)$ is aspherical, atoroidal

proof

16.3 => spherical, toroidal A-maps have zero rank

19.4 reduced diagram of rank i is A-map

Cor 18.2 $XY \overset{i}{=} YX$ then there is Z such that $X \overset{i}{=} Z^k$ and $Y \overset{i}{=} Z^l$ for some k, l

proof By 13.5 $G(i)$ atoroidal => commuting elements belong to a cyclic subgroup.

Th 19.2 Every abelian subgroup of $B(A,n)$ is cyclic.

Let H be abelian subgroup of $G = G(\infty)$.

H has maximal cyclic subgroup $K = \langle x \rangle$

Let $Y \in H \setminus K$

For some i $XY \overset{i}{=} YX$. By Cor. 18.2

$X \overset{i}{=} Z^k, Y \overset{i}{=} Z^l$ for some Z => $\langle X, Y \rangle \subset \langle Z \rangle \cap H$

=> $H = \langle x \rangle$ By 19.1 $X^n = 1$.