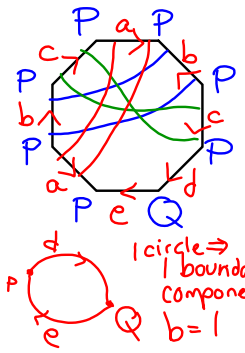
$ab^{-1}cdea^{-1}bc$ non-orientable

$\chi(S) = 2-g-b$



1 face $F=1$

5 edges $E=5$

2 vertices $V=2$

Euler characteristic χ of the surface S

$\chi(S) = V-E+F$

$= 2-5+1 = -2$

non-orientable surface of genus 3 with 1 boundary component

$\chi(S) = 2-g-b$

$-2 = 2-g-1$

$-2 = 1-g$

$g = 1+2 = 3$

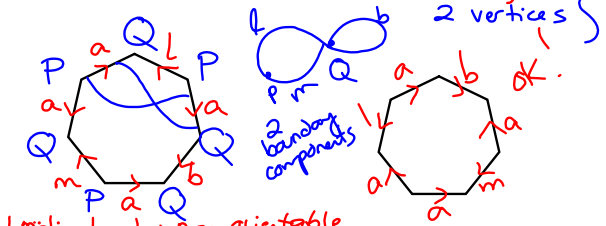
genus g is 3

disk w/ 3 crosscaps

sphere w/ 3 crosscaps & 1 hole

$a^{-1}la^{-1}ba^{-1}ma^{-1}$

1 face
4 edges
2 vertices



1 möbius band ⇒ non-orientable

$\chi(S) = 2-g-b$

$-1 = 2-g-2$

$1 = g \Rightarrow$ 1 crosscap

Euler char χ

$\chi(S) = V-E+F$

$= 2-4+1$

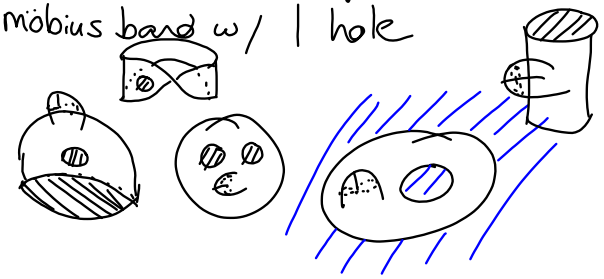
$= -1$

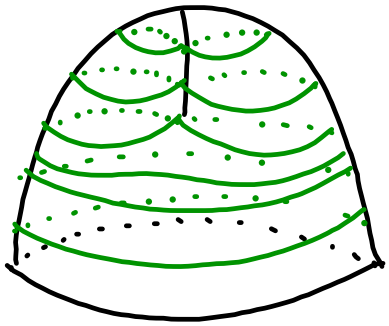
Non-orientable surface of genus 1 w/ 2 boundary components

Sphere w/ 1 crosscap & 2 holes

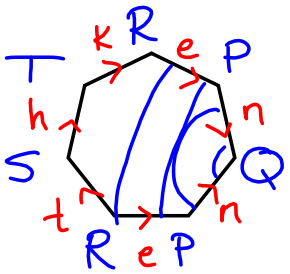
annulus w/ 1 crosscap (cylinder w/ 1 crosscap)

möbius band w/ 1 hole





Kenn^{-1}e^{-1}th



orientable

$\chi(S) = 2-2g-b$

$1 = 2-2g-1$

$1 = 1-2g$

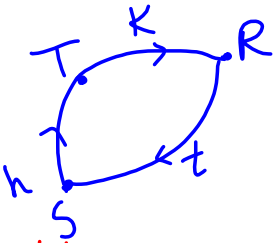
$2g = 0$

$g = 0$

$F = 1$ $\chi(S) = V-e+f$

$E = 5$ $= 5-5+1$

$V = 5$ $= 1$



1 boundary component

Kenneth is an orientable surface of genus 0 w/ 1 boundary component

sphere w/ 1 hole

disk