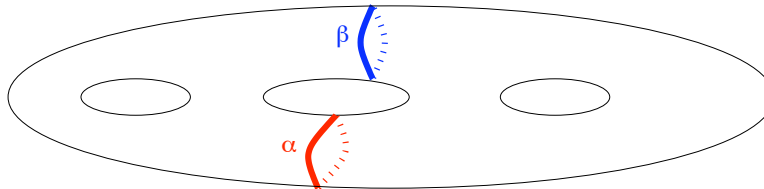


# Algebraic Topology (MATH 722): Final Exam

Due on 5/13/08, 5:00p.m.

You are welcome to use your text to help you solve these problems, but you are not allowed to use other resources such as friends, the internet, other books, faculty, etc.

1. Let  $X_g$  be a Riemann surface of genus  $g$ . Find the Euler characteristic  $\chi(X_g)$ . Use this to prove that  $X_g$  and  $X_{g'}$  are not homotopic equivalent unless  $g = g'$ .
2. Let  $X$  be a Riemann surface of genus 3. Let  $\alpha$  be a loop that goes through the middle hole on one side of the figure, and let  $\beta$  be a loop that goes through the same hole on the other side of the figure. Show that these two loops are homologous (i.e. they represent the same homology class) in CW-homology.



3. Do Problem #8, page 131. No one got this problem correct on the problem set.
4. Let  $X = S^2 \times S^1$ . Compute the homology of  $X$  using Mayer-Vietoris.