Middle East Technical University   Spring 2002   422 Elementary Geometric Topology   Instructor: S. Finashin

HOMEWORK I (due to march 1)

Please, give your solution for each problem on a separate page. Do not forget to write your name and student's number on every page that you submit

Problem 1. *Prove that the curves with the codes* $\langle 1\langle 1\langle 1\rangle\rangle\rangle$ *and* $\langle 1\langle 2\rangle\rangle$ *are not ambient homeomorphic in the plane, deducing it from Jordan's theorem.*

Problem 2. *Determine the rooted trees having the following codes*

(1) $\langle 5 \amalg 1\langle 2\rangle \amalg 1\langle 2\rangle\rangle$
(2) $\langle 3 \amalg 1\langle 1\langle 1\langle 2\rangle \amalg 1\langle 3\rangle\rangle\rangle\rangle$
(3) $\langle 1\langle 2 \amalg 1\langle 2 \amalg 1\langle 1\rangle\rangle\rangle\rangle$

Sketch multi-component curves on a plane with such schemes and estimate their minimal possible degree applying Bezout theorem to suitable lines.

Problem 3. *For a generic immersed curve* γ *sketched below*

(1) *find the rotation number;*
(2) *sketch the multi-component curve obtained by smoothing the double points of* γ *in accord with the orientations; find the rooted forest and the code of the obtained multi-component curve;*
(3) *point out the winding numbers for the regions into which* γ *divides a plane;*
(4) *sketch a chord diagram of* γ *with oriented chords and decorate the arcs of circle with the indices.*
(5) *check your calculation of the rotation number using the decorated chord diagram.*
(6) *Sketch a deformation of* γ *to a curve in a standard form. Specify the types of Arnold's moves involved into your deformation.*