Math 400 Topology Homework Week 2 Block 6 2009-10

Homework:

Instructions: The same rules apply The reading is due at the beginning of class on the given day. However, there are three types of exercises. I want oral presentations in a problem session on or after the given day of those marked with a pound sign (#); I want written solutions on the given day to those that are underlined by 3:30 PM; I expect class discussion on the given day about those marked with an ampersand (&), and I want written solutions to those marked with an asterisk (*) by 9:30 AM on the following Monday. You may neither collaborate with other persons nor consult sources outside the course materials on the problems marked with an asterisk. I encourage you to discuss the others with your classmates or with me. However, your presentation or write-up should be your own.

There will be several F&F problems assigned during the block. I would like you to work on at least two of these (of your own choosing). I will specify the application of the Honor Code and the due date for each one.

M 2
Reading: Finish 3.1; finish 3.2; 3.3
Exercises: <u>1.27</u>, <u>2.28(efg)</u>, <u>3.3</u>, <u>3.14</u>

T 2
Reading: 3.4 (we will divide up the examples to present); 4.1-4.2
Exercises: 3.1&, 3.2&, 3.5#, 3.7#, 3.8#, 3.10#, 3.12#, 3.15&, 3.18#, 3.23&, 3.24#

W2 10:00 AM: PROJECT AND EXAMPLE PRESENTATIONS
Reading: None due
Exercises: None due

R2
Reading: 5.3 - 5.4 (most of this is review); 6.1 – 6.2
Exercises: 3.17#, 3.20#, 3.27#, 3.30#, 3.33&, 3.35#, 3.37*, 4.2&, 4.3*, 4.6(a)#, 4.6(b)*, 4.6&, 4.13(a)#, 4.29#

F2
Reading: Read p.153-54; reread p. 177-78; 6.3, 6.4(thru Theorem 6.28)
Exercises: <u>4.25</u>, <u>4.36</u>, <u>5.20</u>, 5.21&, 6.1&, <u>6.2</u>

M3
Reading: Finish 6.4
Exercises: (due at 1:00 PM) 6.7#, 6.8#, 6.9#, 6.20&, 6.24#, 6.39#, 6.40#

T3
Midterm exam

Additional problems:

Extra 1: Find the examples requested on the handout about separation properties (link) in topological spaces.

F&F: Fame and fortune awaits the solvers of these problems.

F&F.1: Do the two sets $\mathbb{R}$ and $\mathbb{R}\times\mathbb{R}$ have the same cardinality? If your answer is yes, then you must exhibit a bijection between the two. If your answer is no, then you must show no bijection exists. You may collaborate with one other person on this one if you so choose. **It is due by Friday of Week 2 (F2)**

F&F 2: Let (X,d) be a metric space And S b e the set of Cauchy sequences in X. Define a relation ~ on S by declaring $\{s_k\}\sim\{t_k\}$ to mean that $d(s_k,t_k) \to 0$ as $k\to \infty$. **This is due at 9:30 am on R3**.

(a) Prove that the relation ~ is an equivalence relation.

(b) Let X* denote the set of equivalence classes of S and let s* denote the equivalence class of s = $\{s_k\}$. Show that the function $\rho(s^*,t^*) = \lim_{k\to\infty} d(s_k,t_k)$ (for $s^*,t^* \in X^*$ defines a metric on X*.

(c) Show that (X^*,ρ) is complete.

(d) For $x\in X$ define x* to be the constant sequence {x,x,x, …}. Prove that for $x,y\in X$, $d(x,y) = \rho(x^*,y^*)$.

F&F 3: Prove that Tuhp is T3 but not T4. **This is due at 9:30 AM on F3.**