

## Problem Set 3

*Lecturer: Prof. Peter Chin**Due: June 20, 2017*

- ◇ Please email the written portion (either type up your answer or scan your handwritten solution) & code and report to [zhouxiao@bu.edu](mailto:zhouxiao@bu.edu) by 23:59PM on the due date.
- ◇ Late policy: there will be a penalty of 10% per day, up to three days late. After that no credit will be given.

**1. Mathematical calculations**

- (a) Show that the definition of continuity of a map  $f : R \mapsto R$  as the inverse image (or pre image) of open sets being open is equivalent to the usual  $\epsilon - \delta$  definition of continuity.

**2. Programming assignment**

- (a) Write a program using a language of your choice that produces all possible topologies for a given point set  $X = \{x_1, x_2, \dots, x_n\}$  and using your program, generate all possible topologies for  $X = \{x_1, x_2, \dots, x_{10}\}$ .
- (b) Write a program using a language of your choice that produces all possible spanning trees in a given graph using Kruskal's algorithms that we covered in class. Generate an example of graphs so that you can test out your program. For submission, zip the following 3 items: your program, Readme File, 10 examples of graphs, and the outcome. Your program should handle graphs of size up 100 nodes so your examples should have various sizes from small to 100.
- (c) write a program that generates Prufer codes for a given tree. Conversely write a program that constructs a tree given a Prufer sequence. Generate an example of trees and Prufer codes so that you can test out your program. For submission, zip the following 4 items: your program, Readme File, 10 examples of trees, 10 examples of Prufer codes, and the respective outcomes. Your program should handle graphs of size up 100 nodes so your examples should have various sizes from small to 100.