# Mathematic 405, Fall 2015: Assignment #4

Due: **Wednesday, March 4th**

*Instructions:* Please ensure that your answers are legible. Also make sure that sufficient steps are shown. Page numbers refer to the course text.

**Problem #1.** Show that a set $X \subset \mathbb{R}$ is closed if and only if every convergent sequence $\{x_n\}$ with $x_n \in X$ has $\lim_{n\to\infty} x_n \in X$.

**Problem #2.** Let $C$ be the Cantor set. Show that $C$ has no interior points. (Hint: show that any number in $[0,1]$ can be well approximated by a rational number of the form $i3^{-n}$ for $0 \leq i \leq 3^n$).

**Problem #3.** p. 98 # 7

**Problem #4.** Let $A_n \subset \mathbb{R}$ be a nested set of subsets – i.e., $A_{n+1} \subset A_n$. Show that if each of the $A_n$ are compact, then $\cap_{n=1}^{\infty} A_n \neq \emptyset$.

**Problem #5.** p. 106 # 1

**Problem #6.** p. 106 # 6

**Problem #7.** p. 125 # 2

**Problem #8.** p. 125 # 15