Math 330 Section 5 - Spring 2018 - Homework 16

Published: Thursday, April 26, 2018 *Running total:* 55 *points*
Last submission: Monday, May 7, 2018

Status - Reading Assignments:

Here is the status of the reading assignments you were asked to complete by this date.

B/G (Beck/Geoghegan) Textbook:
- all of ch.1 – ch.7 (ch.7: skip all after thm.7.17),
- ch.8 – 13

MF lecture notes:
- ch.1 – ch.3, ch.5 – ch.8 (skip ch.6.3),
- ch.9 (see hwk 10 for exceptions to ch.9.4), ch.10 – ch.12
- ch.17 (Addenda to B/G): the chapters corresponding to what has been assigned so far from B/G.

B/K lecture notes (optional):
- ch.1.1 (Introduction to sets)
- ch.1.2 (Introduction to Functions) but skip ch.1.2.4: Floor and Ceiling Functions

Other:
Stewart Calculus 7ed - ch.1.7: "The Precise Definition of a Limit". If you have a newer or older edition then you may have to search through the table of contents and/or consult the index.

New reading assignments:

Reading assignment 1 - due Wednesday, May 2:

a. Reread the items in MF ch.11 and 12 that gave you the most trouble.

Reading assignment 2 - due: Friday, May 4:

a. Carefully read MF ch.13.1 and 13.2.

This was the last reading assignment for the semester.

Written assignments are on page 2.

Written assignment 1:

Let $f(x) = x^2$. Prove by use of "ε-δ continuity" that f is continous at $x_0 = 1$.

Hints:

a. What does $d(x, x_0) < \delta$ and $d(f(x), f(x_0) < \varepsilon$ translate to?

b. $x^2 - 1 = (x+1)(x-1)$.

c. Only small neighborhoods matter: Given $\varepsilon > 0$ try to find δ that works for $0 < \varepsilon < 1$. Restrict your search to $\delta < 1$. What kind of bounds do you get for $|\, x^2 - 1|$, $|x+1|$, $|x-1|$? if $0 < \delta < 1$?

d. Put all the above together. Show that you obtain $|f(x) - f(x_0)| \leq 3\delta$?. How then do you choose δ when you consider ε as given?

e. All of the above was done under the assumption that $\delta < 1$ Satisfy it by replacing δ with $\delta' := \min(\delta, \_\_\_)$

Written assignment 2: Prove part **d** of MF prop.11.20 (Closure of a set as a hull operator):

Let A be a subset of a topological space $(X, \mathfrak{U})$. Then $\overline{A \cup B} = \bar{A} \cup \bar{B}$.

Hint: Remember how to prove an equation $L = R$ between two sets L and R: Show that each one is a subset of the other.