Math 330 Section 1 - Fall 2016 - Homework 14

Published: Friday, November 11, 2016 *Running total:* 56 *points*
Last submission: Monday(!!), November 28, 2016

Status - Reading Assignments:

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

B/G (Beck/Geoghegan) Textbook:
ch.1 - ch.10 (skim 7.2)

MF lecture notes:
ch.1, ch.2, ch.4-ch.6, ch.8-ch.10

B/K lecture notes (optional reading – good for examples, improved understanding):
ch.1.1, ch.4.1, ch.4.2

New reading assignments:

Reading assignment 1 - due Monday, November 14:
Read carefully B/G Appendix A: Continuity & Uniform Continuity
Reread carefully MF ch.10.2 and relate this to B/G Appendix A

Reading assignment 2 - due: Tuesday, November 15:
Reread carefully MF ch.10.3

Reading assignment 3 - due Wednesday, November 16:
Read carefully B/G(!!) ch.11 (Rational & Irrational #s)

Reading assignment 4 - due Friday, November 18:
Read carefully B/G(!!) ch.12 (Decimal Expansions)

Written assignment 1:

Let $A := \{(x_1, x_2) \in \mathbb{R}^2 : x_1 > 0, x_2 > 0\}$ be the first quadrant in the plane (the points on the coordinate axes are excluded). Prove that each element of A is an inner point, i.e., A is open in $\mathbb{R}^2$.

Written assignment 2:

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

Hint #1: What does $d(x, x_0) < \delta$ and $d(f(x), f(x_0) < \varepsilon$ translate to?
Hint #2: $x^2 - 1 = (x + 1)(x - 1)$.
Hint #3: Only small neighborhoods matter: You may assume (but must state this reason!) that $\varepsilon < 1$ and $\delta < 1$. What kind of bounds do you get for $|x^2 - 1|$, $|x + 1|$, $|x - 1|$?
Hint #4: Put all the above together. Can you see why, for "small" δ, you obtain $|f(x) - f(x_0)| \leq 3\delta$?