Math 330 Section 1 - Fall 2016 - Homework 11

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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.9 up to and including example 9.20

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, October 24:
a. Finish up MF ch.9.1.
b. Read carefully the remainder of MF ch.9. (ch.9.2, Normed vector spaces).
This material will be new to you even if you have completed a linear algebra course.
c. Read carefully MF ch.10 up to the beginning of ch.10.1.1 (Measuring the distance of real functions).

Reading assignment 2 - due: Tuesday, October 25:
Read carefully MF ch.10.1.1.

Reading assignment 3 - due Wednesday, October 26:
Read carefully MF ch.10.1.2.

Reading assignment 4 - due Friday, October 28:
Read carefully MF ch.10.1.3 and ch.10.1.4; skim ch.10.1.5.

Written assignment 1:

Prove B/G prop.10.10(iv): $x, y \in \mathbb{R} \Rightarrow |x - y| \geq \big||x| - |y|\big|$.

Hint: To show this use the following proposition:

Proposition. Let $a, b \in \mathbb{R}$ such that both **#1)** $-a \leqq b$ and **#2)** $a \leqq b$. Then $|a| \leqq b$.

Proof of proposition:
Case 1) $a \geqq 0$: It follows from **#2** that $|a| = a \leqq b$ which is what we had to show.
Case 2) $a < 0$: It follows from **#1** that $|a| = -a \leqq b$ which is what we had to show. ■.

Hint f. assignment 1: first use the triangle inequality on $|x| = |(x - y) + y|$ and then on $|y| = |(y - x) + x|$.
See what you get for $a := |x| - |y|$ and $b := |x - y|$.

Written assignment 2:

Prove B/G prop.10.21(ii): Let $\lim\limits_{k\to\infty} x_k = L$. If $(x_k)_{k=0}^{\infty}$ is decreasing then $x_k \geq L$ for all $k \geq 0$.

Written assignment 3:

Prove B/G prop.10.16: $\lim_{k\to\infty} x_k = L \ \Rightarrow \ \lim_{k\to\infty} x_{k+1} = L$.
Hint: For a clean proof define $y_k := x_{k+1}$.