Math 330 Section 7 - Fall 2026 - Homework 12

Published: Tuesday, October 27, 2026 Running total: 39 points
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Status - Reading Assignments:

The reading assignments you were asked to complete before the first one of this HW are:

MF lecture notes:

ch.1 – 12.2; skim/skip ch.4, 9.9, 10.3, 11.2.3 and 9.9

B/G (Beck/Geoghegan) Textbook:

ch.1 – 7.1, ch.8 – 13.4

Other material (optional):

B/K lecture notes: ch.1.1 (Introduction to sets) (optional) and ch.1.2 (Introduction to Functions)

Stewart Calculus 7ed - ch.1.7: "The Precise Definition of a Limit"

Reading assignment 1 - due: Monday, November 2:

a. Study for the midterm!

Reading assignment 2 - due: Wednesday, November 4:

a. Read carefully MF ch.12.3. What does an open set in $\mathbb{R}$ with $d(x,y) = |y-x|$ and in $\mathbb{R}^2$ with $d(\vec{x},\vec{y}) = \sqrt{|x_2-x_1|^2+|y_2-y_1|^2}$ look like, if $\vec{x} = (x_1, x_2)$, and $\vec{y} = (y_1, y_2)$?

b. Carefully read MF ch.12.4 – 12.5.

b. The stronger students are encouraged to at read the optional ch.11.2.6.

Reading assignment 3 - due Friday, November 6:

a. Carefully read MF ch.12.7. The material about subspaces is tough to digest, since that is a very subtle concept! Draw plenty of pictures! Flesh out the details of Example 12.5 with pencil and paper!

b. Carefully read MF ch.12.8 – 12.9. Much easier than ch.12.7, especially if you draw pictures!

Be sure to read pages 2 and 3!

Supplementary instructions for reading MF ch.12:

When you read or reread any topics in those chapters then the following is good advice:

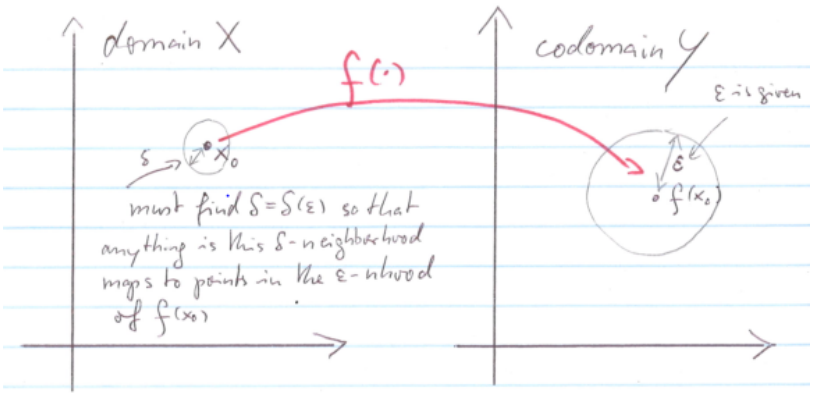
a. MF ch.12.1: Draw as many pictures as possible to get a feeling for the abstract concepts. Use the metric spaces $(\mathbb{R}^2, d\big|_{\|\cdot\|_2})$ and $(\mathscr{B}(X,\mathbb{R}), d\big|_{\|\cdot\|_\infty})$ for this. Do these drawings in particular for

- open sets and neighborhoods (ch.12.3)
- convergence, expressed with nhoods (the end of def.12.10 in ch.12.4)
- metric and topological subspaces (ch.12.7): draw an irregular shaped subset $A \subseteq \mathbb{R}^2$ in two pieces $A = A_1 \biguplus A_2$ which do not overlap. Draw some points $x_j \in A$ with ε–nhoods (circles with radius ε about x_j) so that some circles are entirely in A, one with $x_j \in A_1$ which reaches into $A^{\complement}$ but not into A_2, and one with $x_j \in A_2$ which reaches both into $A^{\complement}$ and A_1. What is $N_\varepsilon^A(x_j)$?
- Contact points, closed sets and closures (ch.12.8): Draw subsets $B \subseteq \mathbb{R}^2$ with parts of their boundary (periphery) drawn solid to indicate that points there belong to B and other parts drawn dashed to indicate that those boundary points belong to the complement. What is $\bar{B}$?

  Draw points "completetely inside" B, others "completetely outside" B, and others on the solid and dashed parts of the boundary. Which ones can you approximate from within B by sequences? Which ones can you surround by circles that entirely stay within B, i.e., which ones are interior points of B? Which ones can you surround by circles that entirely stay outside the closure of B, i.e., which ones are entirely within $\bar{B}^{\complement}$? Use those pictures to visualize the definitions in this chapter and thm 12.7 and thm.12.8.
- Now repeat that exercise with an additional set A which is meant to be a metric subspace of $\mathbb{R}^2$.

b. MF ch.13.2 (Continuity): Draw as many pictures as possible to get a feeling for continuity, especially if you did not take multivariable calculus and are not used to dealing with continuous/differentiable functions of more than one variable. Here is a picture.

Figure 0.1: ε-δ continuity



No written assignments!