Math 330 Section 5 - Spring 2018 - Homework 12

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Update March 24, 2018

> *Fixed error in assignment 1: I wrote originally the following. "... if $\sqrt{r}$ is **irrational** then r is a perfect square", but the contrapositive to "If r is not a perfect square, then $\sqrt{r}$ is irrational" is of course "... if $\sqrt{r}$ is **rational** then r is a perfect square"*

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 – 12

MF lecture notes:
- ch.1 – ch.3, ch.5 – ch.7 (skip ch.6.3),
- ch.9.1 - 9.5 (see hwk 10 for exceptions to ch.9.4).
- 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 Monday, March 26:

- **a.** Review the end of MF ch.7.1, starting at prop.7.9. The material will be used when discussing cardinality.
- **b.** Read carefully MF ch.8 through prop.8.2 ($\text{card}(X) = \text{card}(Y) \Rightarrow \text{card}(2^X) = \text{card}(2^Y)$)
- **c.** Read carefully B/G ch.13.1 and ch.13.2.

Reading assignment 2 - due Wednesday, March 28:

- **a.** Read carefully the remainder of B/G ch.13.
- **b.** Continue carefully reading MF ch.8.1 through remark 8.2.

Reading assignment 3 - Spring Break:

  a. Read carefully the remainder of MF ch.8.
  b. Especially for those who have taken or are currently taking neither Calc 3 nor Linear Algebra: read MF ch.10.1 about the basics of $\mathbb{R}^n$.
  c. Especially for those who have not taken or are not currently taking Linear Algebra: read MF ch.10.2.1 about the basics of general vector spaces.

Written assignment 1:
Let $r \in \mathbb{N}$. Prove that if $\sqrt{r}$ is rational then r is a perfect square (the contrapositive formulation of B/G thm.11.12, p.110).
Hint: Study the proof of B/G prop.11.10 carefully and you'll see that you can use it with small alterations.

Written assignment 2:
Use everything up-to and including B/G prop.11.10 PLUS the fact that the product of two fractions is again a fraction to prove the following: Let $m, n \in \mathbb{Z} \setminus \{0\}$. Then $(m/n)\sqrt{2}$ is irrational.