# Math 330 Section 2 - Spring 2017 - Homework 07

*Published: Thursday, February 9, 2017* *Running total:* $34$ *points*
*Last submission: Friday, February 24, 2017*

**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.5

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

**b.** ch.16 (addenda to B/G text)

B/K lecture notes (optional reading – good for examples, improved understanding):
- ch.1 – section 1, ch.4.1, ch.4.2

**New reading assignments:**

**Reading assignment 1 - due Monday, February 13:**
- Read carefully B/G ch.6.1 - 6.3.

**Reading assignment 2 - due: Tuesday, February 14:**
- Read carefully the remainder of B/G ch.6.

**Reading assignment 3 - due Wednesday, February 15:**
- Read carefully B/G ch.7 until before prop.7.10.

**Reading assignment 4 - due Friday, February 17:**
- Read the remainder of B/G ch.7. Read it carefully until before thm.7.17.

**Written assignment 1:** (One point each for **a** and **b**)

Prove formula b of De Morgan's Law: Let there be a universal set $\Omega$.
Then for any indexed family $(A_\alpha)_{\alpha \in I}$ of sets:

$$\textbf{b.}\ \Big(\bigcap_\alpha A_\alpha\Big)^{\complement} = \bigcup_\alpha A_\alpha^{\complement}$$

**a:** Prove "$\subseteq$". **b:** Prove "$\supseteq$".

**Written assignment 2:** (One point each for **a** and **b**)

Let $L : \mathbb{R}^2 \longrightarrow [0, \infty[$ be the function which assigns to a vector $\vec{x} = (x_1, x_2) \in \mathbb{R}^2$ its "length" $L(\vec{x}) := \sqrt{x_1^2 + x_2^2}$.

For two such vectors $\vec{x} = (x_1, x_2)$ and $\vec{y} = (y_1, y_2)$ we write $\vec{x} \sim \vec{y}$ iff $L(\vec{x}) = L(\vec{y})$.

**a:** Prove that $\sim$ is indeed an equivalence relation for $\mathbb{R}^2$.
**b:** Three of the following $4$ points belong to the same equivalence class:
$(0, 2)$, $(1, 1)$, $(2, 0)$, $(\sqrt{2}, \sqrt{2})$ Which ones?.

**Written assignment 3:** (One point each for **a** and **b**)

Let $X, Y$ be two nonempty sets and let $f : X \longrightarrow Y$. For $a, b \in X$ we write $a \sim b$ iff $f(a) = f(b)$.

**a:** Prove that $\sim$ is indeed an equivalence relation for $X$.

**b:** Write $[x]_f$ for the equivalence class of $x \in X$ with respect to "$\sim$". Express $[x]_f$ in terms of the function $f$: $[x]_f = \{x' \in X : f(x') .....??.......\}$. (I do not want to see "$[x]_f = \{x' \in X : x' \sim x\}$".)