Tentative Assignments - Chapters 5 & 6
(exercises from the *Abstract Algebra: An Introduction, 2nd Ed.*, Thomas Hungerford, Cengage Learning 1996)

Section	Exercises*
5.1	1a, 3, 5, 6, 9-11
5.2	2, 3, 7, 9, 11, 14ab
5.3	1b, 5, 6, 9a, 10
6.1	1, 3, 6, 7, 9, 13a, 15, 18, 21, 23, 25, 27, 29, 33, 38, 41
6.2	2-5, 9, 11, 12a, 14, 15, 21, 23

1. Let $[a]_n$ denote the congruence class of the integer a modulo n and let f be the map from $\mathbb{Z}_7 \to \mathbb{Z}_{21}$ defined by the rule $f([a]_7) = [15a]_{21}$. (c.f., Problem 7 on Exam 1)
   (a) Show that f is well-defined.
   (b) Show that f is a homomorphism of rings.
   (c) Show that f is injective.
2. Show that the map $h : \mathbb{Z}_5 \to \mathbb{Z}_{15}$ given by $h([a]_5) = [8a]_{15}$ is not well-defined.
3. Show that the map $g : \mathbb{Z}_3 \to \mathbb{Z}_9$ given by $g([a]_3) = [6a]_9$ is well-defined but not a homomorphism.
4. Now let $L : \mathbb{Z}_n \to \mathbb{Z}_m$ be defined by $L([a]_n) = [ka]_m$. Give general conditions on the integers $n, m,$ and k which guarantee that L is well-defined.
5. Continuing with the previous exercise, state additional conditions that guarantee L is also a homomorphism of rings.

* - Graded homework exercises will be selected from assigned problems and additional handouts to be distributed throughout the semester.