**Math 241, Introduction to Abstract Algebra – Fall 2019**
**Course website:** `https://sites.aub.edu.lb/kmakdisi/`
**Problem set 5, due Wednesday, October 9 at the beginning of class**

**Quiz 1:** will be held on Wednesday, October 9 at 6pm in Bliss 105.

**Reminder about recitations:** these are every Tuesday at 2pm in Nicely 415.

**Exercises from Fraleigh:**

Section 10, exercises 30, 31, 32, 33, 35, 36, 41, 42, 45.

Hint for exercise 35: given a left coset $C = aH$, show that the set

$$\Phi(C) = \{x^{-1} \mid x \in C\}$$

is a right coset. This allows you to define a bijection between the collection of left cosets and the collection of right cosets.

Note: as part of exercise 36, also do exercise 29 of section 4.

Section 11, exercises 1, 2, 4, 5, 8.

**Additional Exercises (also required):**

**Exercise A5.1:** Let $G = GL(2, \mathbf{R})$, and let $H$ be the subgroup

$$H = \left\{ \begin{pmatrix} 1 & x \\ 0 & 1 \end{pmatrix} \mid x \in \mathbf{R} \right\}.$$

Describe the left and right cosets of $H$ in $G$.

Note: If $C = gH$ is a left coset, and you claim that $C = D$ where you describe $D$ as the set of matrices $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ satisfying specific conditions on $a, b, c, d$, then make sure to show both $C \subseteq D$ and $D \subseteq C$.

**Look at, but do not hand in:**

Section 10, exercise 34, 43, 44, 46.

Section 20, exercises 3, 4, 8, 9, 10 (highly recommended), then 11–18, 29, 30.

Section 11, exercise 10.