

**Math 4710/6710 – Graph Theory – Fall 2019**  
**Assignment 1, due in class, Friday 6th September**

**Please note:**

- Solutions to problems should be fully explained, using clear English sentences where necessary.
- Solutions should be written (or typed) neatly on one side only of clean paper with straight (not ragged) edges.
- Multiple pages should be stapled (not clipped or folded) together.
- Problems are from the newer printings of the textbook. If the problem has a different number in older printings, this will be indicated by '(old x.y.z)'.
- Those registered for Math 4710 may do either of U4 or G4. Those registered for Math 6710 must do G4.

**1.** Problem 1.1.13.

**2.** Problem 1.2.16.

**3.** Read the definition of composition/lexicographic product of simple graphs in Problem 12.1.12 (old 12.3.9). Then do the following.

(a) Draw a NEAT picture of  $C_6[P_3]$ .

(b) Find  $\alpha(C_6)$  and  $\alpha(P_3)$ , and construct an independent set of size  $\alpha(C_6)\alpha(P_3)$  in  $C_6[P_3]$  and show it on your picture from (a).

(c) For arbitrary simple graphs  $G$  and  $H$ , prove that  $\alpha(G[H]) \geq \alpha(G)\alpha(H)$  by using independent sets in  $G$  and  $H$  to construct an independent set in  $G[H]$ .

(d) For arbitrary simple graphs  $G$  and  $H$ , prove that  $\alpha(G[H]) \leq \alpha(G)\alpha(H)$ .

**U4.** Problem 2.1.4.

**G4.** Problem 2.1.5.