Information about Final Exam for Math 3121

The final exam will take place on **Dec 12, 9:30-11:30am** via email. You will receive the exam papers by email around 9:30am on Dec 12 and send your answer to me (mazhu@ust.hk) by email before 11:35am. There will be several different versions of exam of same difficulty level. The format of exam problems are like Homework 5.

List of Important Concepts and Theorems.

The final exam will cover sections 1,4,5,6,8,10,11,13,14,18,19,20,26. The following notions and theorems are required.

Section 1. n-th root of unity, U_n (page 18) , **Section 4.** Group (Definition 4.1). Abelian group (Definition 4.3). Cancelation laws (Theorem 4.15).
Section 5. Subgroup (Definition 5.4). Theorem 5.14. Theorem 5.17. Cyclic subgroup of G generated by a (Definition 5.18). Generator (Definition 5.19).
Section 6. Cyclic group (page 59). Order of a (page 59). Theorem 6.1. Division algorithm for $\mathbb{Z}$. Theorem 6.6. **Section 8.** Symmetric group S_n on n letters (Definition 8.6). **Section 10.** Left coset and right coset (Definition 10.2). Theorem of Lagrange (Theorem 10.10). Theorem 10.12.

Section 11. Direct product of groups (Theorem 11.2). **Section 13.** Homomorphisms (Definition 13.1). Theorem 13.12. Kernel $Ker(\phi)$. Theorem 13.15. Corollary 13.18. Normal subgroup (Definition 13.19). Corollary 13.20.
Section14. Factor group (Theorem 14.4, Definition 14.6). Theorem 14.9. Theorem 14.11.

Section18. Ring (Definition 18.1). Ring homomorphism (Definition 18.9). Commutative ring, unity (Definition 18.14). Field (Definition 18.16). Theorem 18.8. **Section19**. 0 divisors (Definition 19.2). Integral domain (Definition 19.6). Theorem 19.3. Theorem 19.9. Theorem 19.11. Corollary 19.12.
Section20. Theorem 20.1, Theorem 20.6, Theorem 20.8. **Section26**. Ring homomorphism (Definition 26.1=Definition 18.8). Kernel (Definition 26.4).

Important Examples of Groups

Additive groups: $\mathbb{Z}, \mathbb{Q}, \mathbb{R}, \mathbb{C}, \mathbb{Z}_n$. Multiplicative groups: $\mathbb{Q}^*, \mathbb{R}^*, \mathbb{C}^*, U_n$,G_n(page186). General linear group: $GL(n, \mathbb{R})$ (page 40).

Important Examples of Rings

$\mathbb{Z}, \mathbb{Q}, \mathbb{R}, \mathbb{C}, \mathbb{Z}_n$. Matrix ring $M_n(\mathbb{R})$ (page 168).