Exam III
Review

On this review sheet there are 16 definitions listed. You will be asked to state 5 of the 16 listed definitions (15% of the exam).

On this review sheet there are 4 theorems (some of which have multiple parts) listed with an indication that you should know how to prove them. You will be asked to prove one part of one of the 4 listed theorems (15% of the exam).

On this review sheet there is a reference to providing Examples of Rings, Integral Domains and Fields. 1 of the problems on the exam will ask you to provide Examples of Rings, Integral Domains and Fields with specified conditions, which are different from the specific examples listed in Figure 1 page 207 (10% of the exam).

<table>
<thead>
<tr>
<th>Section</th>
<th>Topics</th>
<th>Listed Definitions / Exam Prototype Problems</th>
</tr>
</thead>
</table>
| 2.2     | Definition of a group homomorphism  
Definition of the kernel of a homorphism  
Prop. 2.2.15 Basic homomorphisms properties  
Prop. 2.2.16 & 2.2.17 (Proofs)  
Definition of an isomorphism  
Conditions to verify groups are isomorphic  
Prop. 2.2.23 Consequences of isomorphism | Definitions  
2.2.2, 2.2.11, 2.2.18  
Problems, Page 80  
2, 8, 20, 24, 25, 26, 35, 41 |
| 2.3     | Definition of a normal subgroup  
Prop. 2.3.3/2.3.5  
Theorem 2.3.10 | Definitions  
2.3.4  
Problems, Page 92  
1, 3, 4, 13 |
| 2.4     | Theorem 2.4.3 Group of cosets  
Definition 2.4.4 Quotient Group  
Prop. 2.4.9 Inherited Properties of Quotient Group  
Theorem 2.4.15 First Isomorphism Theorem  
Prop. 2.4.18  
Theorem 2.4.19  
Commutative Diagrams  
Cauchy’s Theorem for Abelian Groups | Definitions  
2.4.4  
Problems, Page 100  
1-4, 7-9, 13 |
| 3.1     | Theorem 3.1.4 Product Group  
Definition 3.1.5 Direct Product Group  
Proposition 3.1.8 |  |
| 3.2     | Theorem 3.2.3 Order of an element of a direct product group  
Theorem 3.2.8 $\mathbb{Z}_n \times \mathbb{Z}_m$ |  |
<table>
<thead>
<tr>
<th>Section</th>
<th>Topics</th>
<th>Listed Definitions / Exam Prototype Problems</th>
</tr>
</thead>
</table>
| 6.1     | Definition of a ring  
Prop. 6.1.8 Multiplication Facts for Rings (Proofs)  
Definition 6.1.9  
Definition of subring  
Theorem 6.1.13 Conditions to be a subring | Definitions  
6.1.2, 6.1.9, 6.1.12  
Problems, Page 197  
1-6, 11, 13, 15 |
| 6.2     | Definition of a zero divisor  
Theorem 6.2.4 Zero divisors in $\mathbb{Z}_n$  
Corollary 6.2.5 $\mathbb{Z}_p$  
Cancellation Laws  
Theorem 6.2.7 Equivalence of Cancellation Laws and Non-existence of Zero Divisors (Proofs)  
Definition of Integral Domain  
Definition of subdomain  
Prop. 6.2.11 Conditions to be a subdomain | Definitions  
6.2.2, 6.2.8, 6.2.10  
Problems, Page 201  
1-7, 8, 9, 13, 14, 16 |
| 6.3     | Definition of unit  
Theorem 6.3.5  
Theorem 6.3.6  
Definition of a field  
Theorem 6.3.14 Every finite integral domain is a field  
Coro. 6.3.15  
Definition of a subfield  
Prop. 6.3.17 Conditions to be a subfield  
Definition of a division ring  
Definition of the characteristic of a ring | Definitions  
6.3.3, 6.3.11, 6.3.16, 6.3.21, 6.3.24  
Problems, Page 208  
1-8, 16-22, 23, 24-26  
Examples of rings, integral domains, fields (see Figure 1 page 207) |