Math 31 Homework 5
Due August 4, 2018

1. Chapter 15, exercise C5.

2. Chapter 15, exercise D1.

3. Chapter 14, exercise C4.

4. Let G, H be groups. Prove that $(G \times H)/(G \times \{e\}) \cong H$.

5. Let G be an abelian group of order 120 that has exactly three elements of order 2.

   (a) List all possible abelian groups (up to isomorphism) of order 120.

   (b) Determine the isomorphism class of G.

6. Prove the last part of the Third Isomorphism Theorem: If $K \trianglelefteq G$ and $H \trianglelefteq G$ such that $K \subseteq H \subseteq G$, then
$$(G/K)/(H/K) \cong G/H.$$

   You may use the previous parts of the Third Isomorphism Theorem.
   (*Hint*: Find a homomorphism between related groups, then use the First Isomorphism Theorem to get the result.)