Math 620 HW1- Due Tuesday January 20

1. Page 914 #1, 3 Page 918 #1-3

2. Let $\mathcal{C}$ be a category and $\{A_i \mid i \in I\}$ a family of objects of $\mathcal{C}$. A **product** for the family is an object P of $\mathcal{C}$ (usually denoted $\Pi_{i\in I} A_i$) together with a family of morphisms $\{\pi_i : P \to A_i \mid i \in I\}$ such that for any object B and family of morphisms $\{\phi_i : B \to A_i \mid i \in I\}$, there is a unique morphism $\phi : B \to P$ such that $\pi_i \circ \phi = \phi_i$ for all $i \in I$.

a. Describe a product for $\{A_1, A_2\}$ in terms of commutative diagrams.

b. Show that in the category of groups, $G_1 \times G_2$ with the usual projections maps π_1, π_2 is a product for $\{G_1, G_2\}$.

c. Come up with a definition of **coproduct** by reversing arrows in the definition of product.

d. Show that $Z_2 \times Z_3$ is a coproduct for Z_2 and Z_3 in the category **Ab** but not in the category of finite groups.