Exercise 1. Let D be an integral domain. Prove that if $p_1, p_2, \ldots, p_m, q_1, q_2, \ldots, q_n \in D$ ($m, n \in \mathbb{Z}^+$) are primes and $p_1 p_2 \cdots p_m = q_1 q_2 \cdots q_n$ then $m = n$ and, after possibly reordering, p_i and q_i are associates for $i = 1, 2, \ldots, m$. [*Suggestion:* Induct on m.]

Exercise 2. Let R be a ring and let $I_1 \subset I_2 \subset I_3 \subset \cdots$ be an ascending chain of ideals in R and let

$$I = \bigcup_{j=1}^{\infty} I_j.$$

a. Prove that I is an ideal in R.

b. If R has an identity and each I_j is proper, prove that I is also proper.

Exercise 3. Page 335, # 38

Exercise 4. Page 340, # 24