1. **Assume** the following facts. Let $\Sigma$ be an alphabet.

   (a) For all strings $w \in \Sigma^*$, $w\lambda = \lambda w = w$.  
       (\lambda is the identity element for string concatenation.)
   (b) For all strings $w \in \Sigma^*$, $w^0 = \lambda$.
   (c) For all strings $w \in \Sigma^*$ and integers $n \geq 0$, $w^{n+1} = w^n w$.
   (d) For all strings $u \in \Sigma^*$, $v \in \Sigma^*$, and $w \in \Sigma^*$, $u(vw) = (uv)w$.  
       (Associativity of concatenation.)
   (e) $|\lambda| = 0$.
   (f) For all strings $w \in \Sigma^*$ and symbols $a \in \Sigma$, $|wa| = |w| + 1$.
   (g) $\lambda^R = \lambda$.
   (h) For all strings $w \in \Sigma^*$ and symbols $a \in \Sigma$, $(wa)^R = aw^R$.
   (i) Basic properties of integer arithmetic such as associativity and commutativity of addition and multiplication, identity elements for addition (i.e., 0) and multiplication (i.e., 1), and distribution of multiplication over addition.

   **Prove** $(uv)^R = v^R u^R$ for all strings $u \in \Sigma^*$ and $v \in \Sigma^*$. Give justifications for each of your steps (e.g., facts from the above list).

2. Exercise 5 on page 27.
3. Exercise 8, parts (a) and (c), on page 27.
4. Exercise 11, parts (a) and (c), on page 27.
5. Exercise 1 on page 33.
7. **Required for CSci 500 students, optional for CSci 311:**
   Exercise 9 on page 34.