1.

Let Σ be any alphabet. Use the inductive definition of reversal of a string given in the previous problem to prove that (wR)R = w for any w ∈ Σ∗. Note that an obvious choice for your method of proof is induction on the length of the string.

**Solution:** length(w) = 0, which means w = ɛ. From the definition of the reversal of a string (that given in String Theorems note), we have that ɛR = ɛ. So, (w R)R = (ɛ R)R = (ɛ R) = ɛ= w, and therefore our claim holds for length(w) = 0. Assume that (w R)R = w for every string w such that length(w) = k, where k is an integer with k ≥ 0. We need to prove that (w R)R = w for every string w such that length(w) = k+1. Since k + 1 ≥ 1, we can write , where and \*. From the definition of reversal of a string. we know that w R = (ua)R = auR. We also know that (w R)R = (auR)R = (uR)Ra. Since the length of u is k, we can use the induction hypothesis to conclude that (uR)R = u. So, (w R)R = (auR)R = (uR)Ra = ua = w, and our claim also holds for \* such that length(w) = k + 1.

2.

abaabaaabaa, aaaabaaaa, baaaaabaa

3.

L’ = {λ, a, b, ab, ba} {w {a, b}+ : |w| ≥ 3}

4.

1. S AaA, A bA| λ
2. S AaA, A aA| bA| λ
3. S A| AaA| AaAaA| AaAaAaA, A bA| λ
4. S AaAaAaA, A aA| bA| λ

5.

The language generated by the grammar = 𝜆, ab, aba, abab

6.

The language accepted by above grammar =

7.

First grammar – 𝜆, ab, aabb, aaabbb, ...........

Second grammar - ab, aabb, aaabbb, ...........

Above two grammars with respective productions are not equivalent

8.

S ⟶ aSb | bSa | SS| a

a, aa, aab, aaab, aaabb, aaaabb, abaab, abaaab, baa, baaa, bbaaa, bbaaaa, baaba, baaaba

S ⟶ aSb | bSa | a

a, aab, aaabb, abaab, baa, bbaaa, baaba

Based on the above results we can see the grammars are not equivalent.