Practice Problems

1. For each of the following regular expressions over the alphabet \(\{a, b\}\), exhibit a string, over \(\{a, b\}\), that does not belong to the corresponding language:
   
   (a) \((baa^*)^* \cup a^*b^*\)
   (b) \((a^*b(aa^*)^* \cup a^*\)

2. Show that the following context-free grammars are ambiguous. In every case, the start symbol is \(<S>\) and the terminal alphabet is \(\{a, b\}\).
   
   (a) \(<S> ::= <S>a<S> | b\)
   (b) \(<S> ::= a<S><S> | a | aa\)
   (c) \(<S> ::= a<S>b | <S>b | <\text{empty}>\)
   (d) \(<S> ::= a<S><S>bb | <\text{empty}>\)
   (e) \(<S> ::= a<S>b<S> | b<S> | a\)
   (f) \(<S> ::= a<S>ab | a<S>b | aa<S>a | <\text{empty}>\)