1. $\text{first}(S) = \text{first}(\text{A}dg) \cup \text{first}(\text{B}h) = \{a, d, f, g\}$

   $\text{first}(A) = \text{first}(a\text{B}c) \cup \text{first}(\epsilon) = \{a, \epsilon\}$

   $\text{first}(B) = \text{first}(f) \cup \text{first}(f) = \{f, g\}$

2. a. $\text{S} \longrightarrow b\text{L}$
   $\text{L} \longrightarrow +a\text{L} \mid +b\text{L} \mid \epsilon$

   b. $\text{S} \longrightarrow \text{cL}$
   $\text{L} \longrightarrow +\text{M} \mid \epsilon$
   $\text{M} \longrightarrow a\text{L} \mid b\text{L}$

   c. $\text{S} \longrightarrow a\text{L}$
   $\text{L} \longrightarrow bc \mid c$

   d. $\text{S} \longrightarrow a\text{L}$
   $\text{L} \longrightarrow a \mid b \mid \epsilon$

   e. $\text{S} \longrightarrow a\text{SL} \mid b$
   $\text{L} \longrightarrow c \mid b$

3. a. $\text{first(true)} = \{\text{true}\}$

   $\text{first(false)} = \{\text{false}\}$

   $\text{first((S))} = \{(\}$

   $\text{first(S and S)} = \{(, \text{true}, \text{false}\}$

   $\text{first(S or S)} = \{(, \text{true}, \text{false}\}$

   b. The first sets of the productions intersect and the grammar is left recursive.

4. a. $\text{first}(ab\text{S}) = \{a\}$

   $\text{first}(ac\text{S}) = \{a\}$

   $\text{first}(c) = \{c\}$

   $\text{first(S)} = \{a, c\}$

   b. The first sets of the productions overlap: $\text{first}(abS) \cap \text{first}(acS) = \{a\} \cap \{a\} \neq \emptyset$.

   c. $\text{S} \longrightarrow a\text{L} \mid c$
   $\text{L} \longrightarrow b\text{S} \mid c\text{S}$

   d.
```
parse_S() {
  if (lookahead == "a") {
    match("a");  // S -> aL
    parse_L();
  } else
    if (lookahead == "c")
      match("c");  // S -> c
    else error();
}

parse_L() {
  if (lookahead == "b") {
    match("b");  // L -> bS
    parse_S();
  } else
    if (lookahead == "c") {
      match("c");  // L -> cS
      parse_S();
  } else error();
}
```