1. Complete slides 33, 34, and 35 from CFL Closure Properties PPP. I have handouts for these slides and you can fill them in.

2. Sipser textbook problems:
   - 3.1d
   - 3.2e
   - 3.8b
   - 3.8c

3. Create a TM that accepts $L = \{a^n b^n c^n | n \geq 0\}$
1. ...

2. Sipser Textbook questions:
   - Sipser 3.1d.
     $q_000000, q_00000, 2x0q300, 2x0x0q40, 2x0x0q2, 2x00x0q12, 2x0x0q5x2,
     2x0q5x2, 2x0q5x0x2, 2xq50x0x2, 2xq50x0x2, q52x0x0x2, 2xq20x0x2, 2xq20x0x2,
     2xq2x0x2, 2x0q30x2, 2xxx0q4x2, 2xxx0q4x2, 2xxx0x2qreject
   - Sipser 3.2e.
     $q10#10, 2xq3#10, 2x0q3#10, 2x0#q310, 2x0q0#x02, 2xq7#0#x02, 2q7x0#x02,
     2xq10#x02, 2xxq2#x02, 2xx#q4x02, 2xx#q4x02, 2xx#q6xx2, 2xx#q6xx2, 2xxq7#x2,
     2xxq1#xx2, 2xxq8xx2, 2xx#q8xx2, 2xx#q8xx2, 2xx#q8xx2accept
   - Sipser 3.8b.
     On input string w:
     1. Scan the tape and mark the _rst 0 that has not been marked. If there is no
        unmarked 0, go to step 5.
     2. Continue scanning and mark the next unmarked 0. If there is not any on the
        tape, reject. Otherwise, move the head to the front of the tape.
     3. Scan the tape and mark the _rst 1 that has not been marked. If there is no
        unmarked 1, reject.
     4. Move the head to the front of the tape and repeat stage 1.
     5. Move the head to the front of the tape. Scan the tape for any unmarked 1s.
        If none, accept. Otherwise, reject.
   - Sipser, 3.8c.
     On input string w:
     1. Scan the tape and mark the _rst 0 that has not been marked. If there is no
        unmarked 0, go to step 5.
     2. Continue scanning and mark the next unmarked 0. If there is not any on the
        tape, accept. Otherwise, move the head to the front of the tape.
     3. Scan the tape and mark the _rst 1 that has not been marked. If there is no
        unmarked 1, accept.
     4. Move the head to the front of the tape and repeat stage 1.
     5. Move the head to the front of the tape. Scan the tape for any unmarked 1s.
        If none, reject. Otherwise, accept.
3. Create a TM that accepts \( L = \{a^n b^n c^n \mid n \geq 0\} \)

Intuitively, solve as follows: starting at the leftmost \( a \), check it off by replacing it with some symbol \((x)\). Then let the read-write head travel right to the leftmost \( b \), which is checked off by replacing it with another symbol \((y)\). The read-write head travels right again to find the leftmost \( c \), replacing it with yet another symbol \((z)\). Sweep left to find the first \( x \), then go right and cross off another \( a \) (if it exists) and repeat the above. When we reach the end of the input, travel left over the tape to check that all the symbols have been rewritten. Also, if the input contains a string that is not in the language, halt the TM immediately and reject.

Complete solution:
\( Q = \{q_0, q_1, q_2, q_3, q_4, q_5\} \)
\( F = \{f_5\} \)
\( \Sigma = \{a, b, c\} \)
\( \Gamma = \{a, b, c, x, y, z, B\} \)
\( \delta \) transition functions:
\[
\delta(q_0, a) = (q_1, x, R) \\
\delta(q_0, x) = (q_0, x, R) \\
\delta(q_0, y) = (q_4, y, R) \\
\delta(q_1, a) = (q_1, a, R) \\
\delta(q_1, y) = (q_1, y, R) \\
\delta(q_1, b) = (q_2, y, R) \\
\delta(q_2, b) = (q_2, b, R) \\
\delta(q_2, z) = (q_2, z, R) \\
\delta(q_2, c) = (q_3, z, L) \\
\delta(q_3, c) = (q_3, b, R) \\
\delta(q_3, b) = (q_3, b, R) \\
\delta(q_3, y) = (q_3, y, L) \\
\delta(q_3, a) = (q_3, a, R) \\
\delta(q_3, x) = (q_0, x, R) \\
\delta(q_4, y) = (q_4, y, R) \\
\delta(q_4, z) = (q_4, z, R) \\
\delta(q_4, B) = (q_5, B, R) \\
\]