• Prove that $f = ab + cd + b'd' + a'c'd + a'bd' + ab'd$, is a tautology by using the recursive Shannon expansion. Show the recursive tree expansion.

• Find the complement of $f = a'c' + b'c' + bc$, by using the recursive Shannon expansion. Show the recursive tree expansion.

• By using the recursive Shannon expansion, decide whether $bd$ is contained within the cover $F = abc + a'c'd + acd + a'bc$. Show the recursive tree expansion.