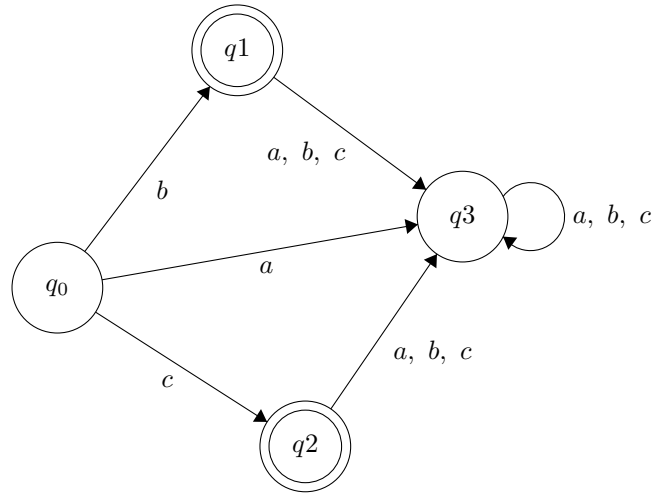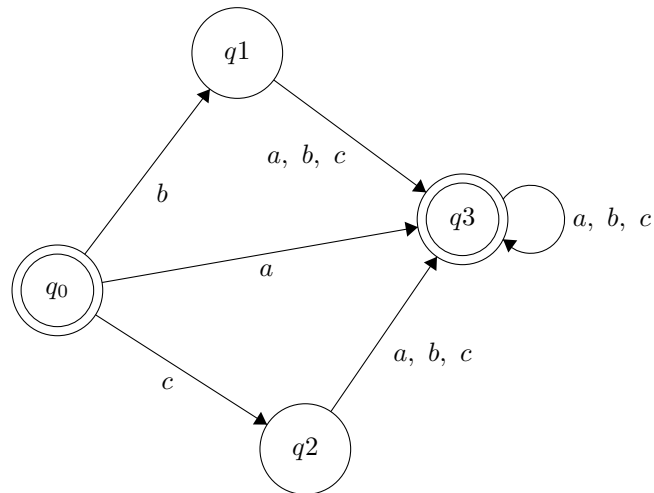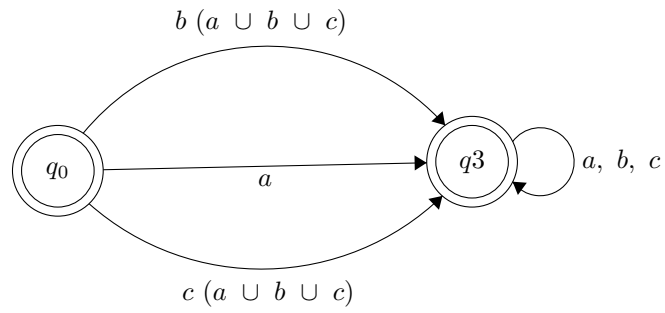4. Using the example given in the book where R = b ∪ c
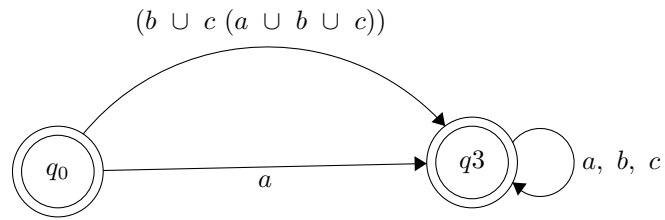

To convert R into R compliment we must make all the non-accept states into accept state, and all the current accept states into non-accept states and then turn the DFA into a GNFA for the regular expression.
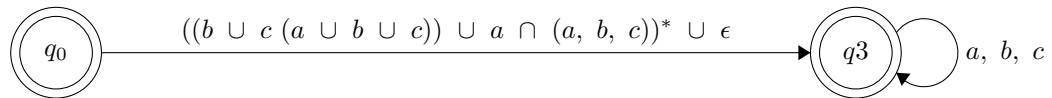

Now we can begin turning our DFA$_{Rcompliment}$ into a GNFA.

$b \ (a \ \cup \ b \ \cup \ c)$

q_0 a $q3$ $a, \ b, \ c$

$c \ (a \ \cup \ b \ \cup \ c)$

We can still combine parts though we do this by combining the top line and bottom line:

$(b \ \cup \ c \ (a \ \cup \ b \ \cup \ c))$

q_0 a $q3$ $a, \ b, \ c$

Finally we can combine the last two ways and add the ability to loop at the accept state:

q_0 $((b \ \cup \ c \ (a \ \cup \ b \ \cup \ c)) \ \cup \ a \ \cap \ (a, \ b, \ c))^* \ \cup \ \epsilon$ $q3$ $a, \ b, \ c$

We now have a regular expression for R compliment $((b \cup c \ (a \cup b \cup c)) \cup a \cap (a, \ b, \ c))^* \cup \epsilon$