Theory of Computation, Fall 2022
Assignment 4 Solutions

Q1. (25 pts)
$S \to 0|1|0S0|1S1|0S1|1S0$

Q2. (25 pts)
$S \to e|1S0|0S1|SS$

Q3. (30 pts)
$S \to AB$
$A \to 0A0|1A1|\#B$
$B \to 0B|1B|e$

another solution:
$S \to S1|S0|A$
$A \to 1A1|0A0|B$
$B \to \#|B1|B0$

Q4. (20 pts)
For every $w \in L(G)$, we need exactly $2|w| - 1$ steps of derivations since G is in Chomsky norm form. And in every step, there are at most $|R|$ choices, so the number of distinct derivations from S to w is no more than $|R|^{2|w|-1}$, which is finite.