2. a. ~~S → aSa~~
~~S → bSa~~
~~S → ε~~

$S \to 0S0$
$S \to 1S1$
$S \to \epsilon$

~~For 010~~010:
~~$S \to \epsilon$~~

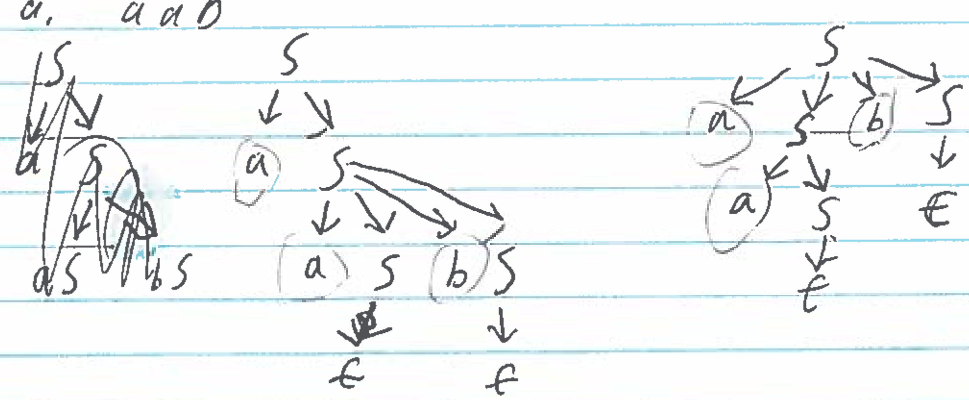
For 010010:
$S \to 0S0 \to 0(1S1)0 \to 01(0S0)10 \to 010010$

b. $S \to TY$
$T \to aTb$
$Y \to cY$
$S \to \epsilon$
$T \to \epsilon$
$Y \to \epsilon$

c. $S \to TY$
$T \to aT$
$Y \to bYc$
$S \to \epsilon$
$T \to \epsilon$
$Y \to \epsilon$

d. $S \to abS$ $\qquad$ $S \to Sab$
$S \to \epsilon$ $\qquad$ $S \to \epsilon$

4. a. aab



b. $S \to aS \to aaSbS \to aabS \to aab$
$S \to aSbS \to aaSbS \to aabS \to aab$

c. $S \to aS \to aaSbS \to aaSb \to aab$
$S \to aSbS \to aSb \to aaSb \to aab$

EC. For the grammar $S \to aS \mid aSbS \mid \epsilon$, there are three results for each transition in the rule. Two of those, aSbS and ϵ, have the same number of a's and b's, while the remaining result, aS, has more a's than b's. With these three results for the grammar $S \to aS \mid aSbS \mid \epsilon$, there will always be at least as many a's ~~a's~~ b's, because there is no result to the rule that can cause there to be more b's than a's.