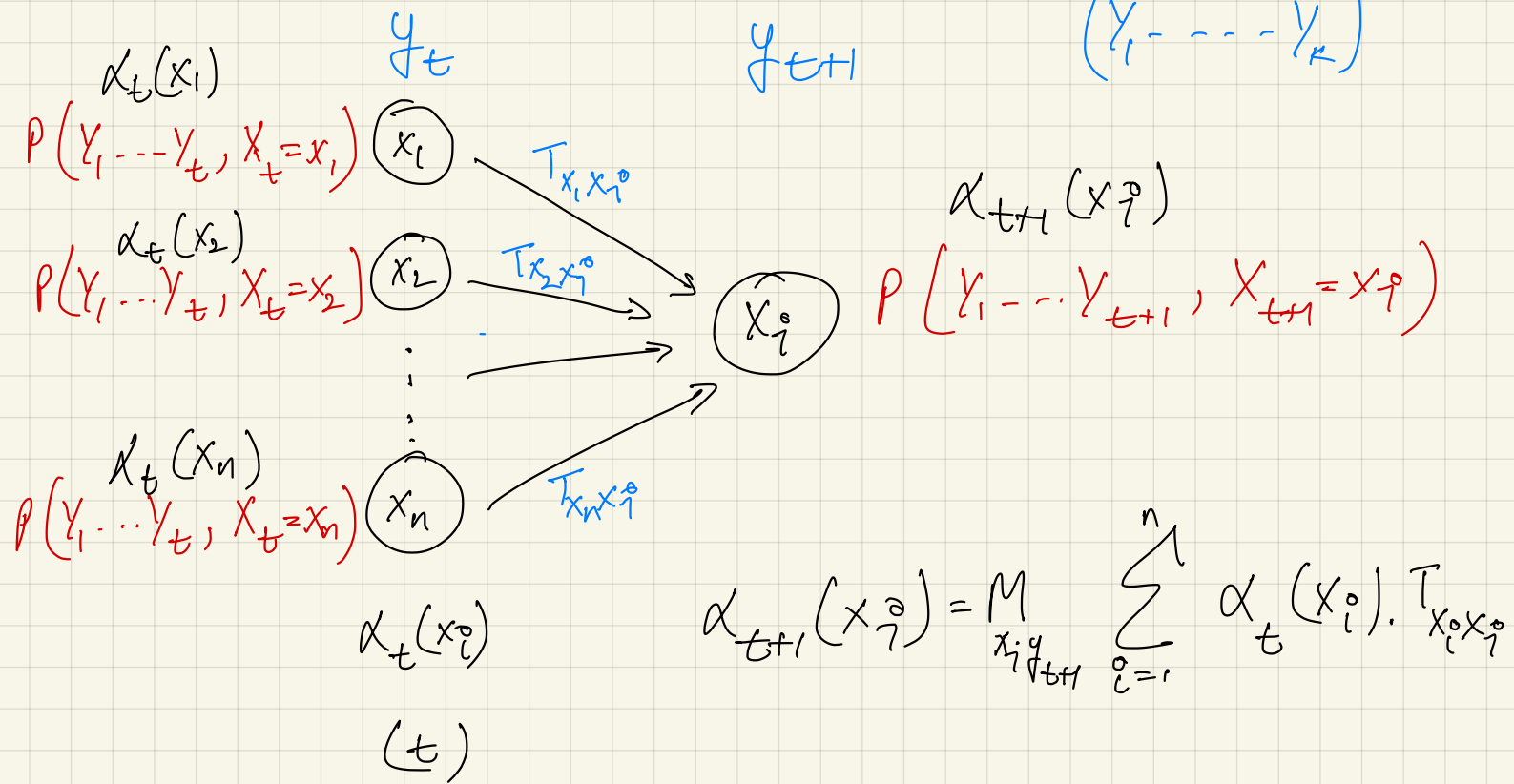
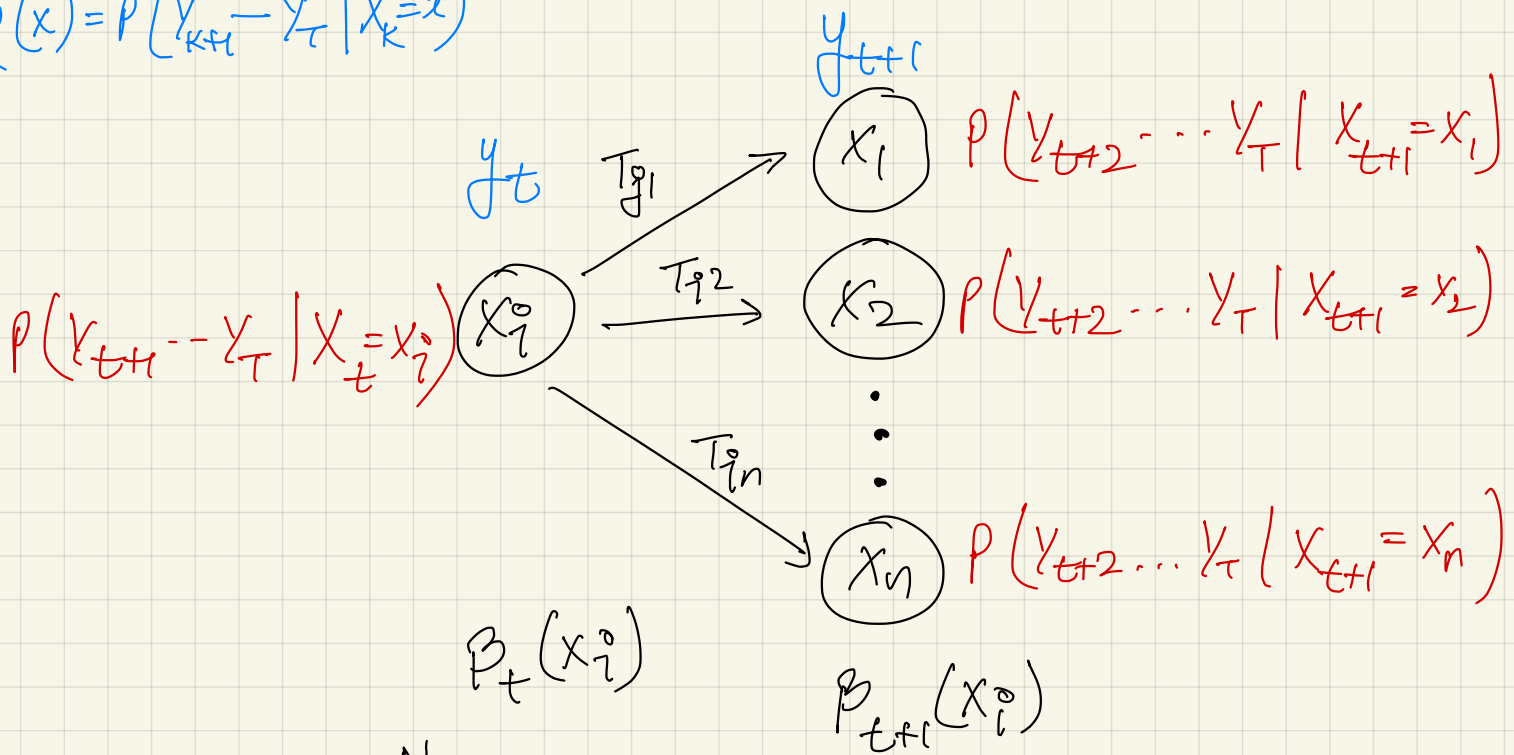


HMM Forward Variable  $\alpha_k(x) = P(Y_1 \dots Y_k, X_k = x)$

$(Y_1 \dots Y_k)$



$$\beta_k(x) = P(Y_{k+1} - Y_T | X_k = x)$$



$$\beta_t(x_i^0) = \sum_{i=1}^N \beta_{t+1}(x_i^0) \cdot T_{x_i^0 x_i^0} \cdot M_{x_i^0} f_{t+1}$$