$$P[X(t_{k+1}) = x_{k+1}|X(t_k) = x_k, \ldots, X(t_1) = x_1] = P[X(t_{k+1} = x_{k+1}|X(t_k) = x_k]$$

$$P[a < X(t_{k+1}) \leq b|X(t_k) = x_k, \ldots, X(t_1) = x_1] = P[a < X(t_{k+1}) \leq b|X(t_k) = x_k]$$

$$P[X_{k+1} = x_{k+1}, X(t_k) = x_k, \ldots, X(t_1) = x_1] = P[X(t_3) = x_3|X(t_2) = x_2]P[X(t_2) = x_2|X(t_1) = x_1]P[X(t_1) = x_1]$$

- An integer valued Markov random process is called a Markov chain
- $P_j(0) \triangleq P[X_0 = j]$ and $P[X_{n+1} = j|X_n = j] = p_{ij}$

$$P[X_n = i_n, \ldots, X_0 = i_0] = p_{i_{n-1},i_n} \ldots p_{i_0,i_1} p_{i_0}(0)$$