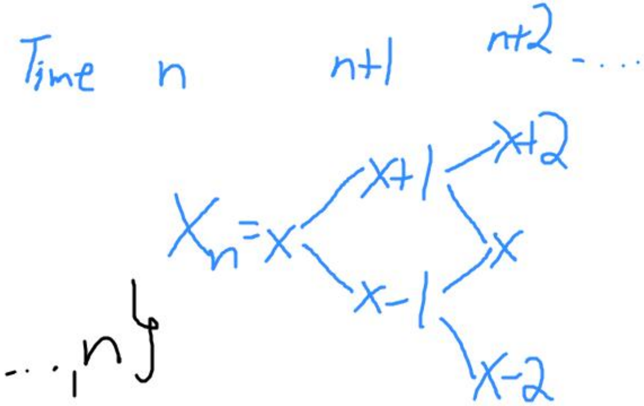
3 a) $X_n = V_n^A - V_n^B$



$\mathbb{P}$ of person (n+1) vote for A $\quad \frac{V_n^A}{n}$

$f_n(x) = \mathbb{P}(X_N > 0 \mid X_n = x) \quad x \in \{-n, -n+1, \dots, n\}$

$Y_n = \begin{cases} 1 & \text{if vote } n \text{ is for A} \\ 0 & \text{if vote } n \text{ is for B} \end{cases} \quad Y_n = 1_{\{\text{Vote } n \text{ is for A}\}}$

$V_{n+1}^A = V_n^A + Y_{n+1} \quad V_{n+1}^B = V_n + 1 - Y_{n+1}$

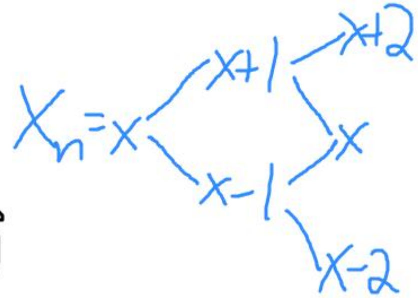
$\mathbb{P}(X_{n+r} = \tilde{x} \mid X_n = x)$

$X_{n+1} = X_n + 2Y_{n+1} - 1 \quad \boxed{\mathbb{P}(X_{n+1} = x) \mid X_n = x)}$

$X_{n+1} \in \{X_n + 1, X_n - 1\}$

3 a) $X_n = V_n^A - V_n^B$

Time n $n+1$ $n+2$ ....



$\mathbb{P}$ of person $(n+1)$ vote for A $\frac{V_n^A}{n}$

$f_n(x) = \mathbb{P}(X_N > 0 \mid X_n = x)$ $x \in \{-n, -n+1, \dots, n\}$

$$\mathbb{P}(X_{n+1} = x' \mid X_n = x) = \begin{cases} \frac{V_n^A}{n} & \text{if } x' = x+1 \\ 1 - \frac{V_n^A}{n} & \text{if } x' = x-1 \\ 0 & \text{otherwise} \end{cases}$$

$$\mathbb{P}(X_{n+2} = x+2 \mid X_n = x) = \mathbb{P}(X_{n+2} = X_n + 2)$$

$\mathbb{P}(X_{n+r} = \tilde{x} \mid X_n = x)$

$$\mathbb{P}(X_{n+2} = X_n) = \boxed{\mathbb{P}(X_{n+2} = X_{n+1} + 1) \cdot \mathbb{P}(X_{n+1} = X_n - 1) + \mathbb{P}(X_{n+2} = X_{n+1} - 1) \cdot \mathbb{P}(X_{n+1} = X_n + 1)}$$

2° American option intrinsic value $(G_1, G_2, \dots, G_N) = G$

V_n arbitrage-free price

a) $\boxed{V_\sigma = G_\sigma}$ for some stopping time

σ optimal time?

$\boxed{\text{maximizes } V_0^\sigma}$

τ other stopping time

$\boxed{V_0^\sigma \geq V_0^\tau}$

$V_0 = \boxed{\max_{\tau \text{ stopping time}} V_0^\tau}$

$V_0 = V_0^{\sigma^*}$

$\boxed{\sigma^* = \min\{n \mid V_n = G_n\}}$