Probability with Martingales booklet by Alain Chenier, page 1 of 2, 6th May 2017

•Distribution of $\boxed{Z_n}$ obtained from generating $\Rightarrow f_n(\theta) = E(\theta^{Z_n}) = \sum \theta^k \boxed{P(Z_n = k)}$

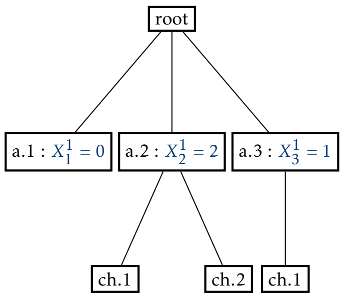
•$f_{n+1}(\theta) = E\theta^{Z_{n+1}} = E\left(\boxed{E\theta^{Z_{n+1}}|Z_n}\right) = \sum \boxed{E\left(\theta^{Z_{n+1}}|Z_n\right)} P(Z_n = k) \leftarrow \boxed{E\theta^{Z_{n+1}}|Z_n}$ is the random variable here

1 Chapter 0

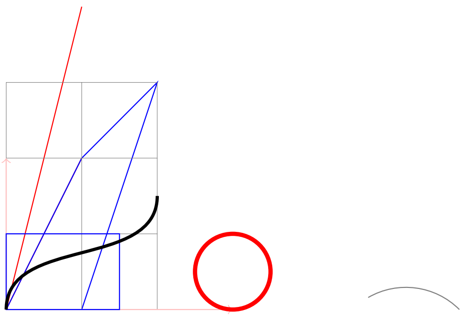
$\mathbf{Z}+ = [0, 1..] \quad \mathbf{N} = [1..]$
$f(\theta) = E(\theta^X) = \sum \theta^k P(X = k) = P(X - 0) + \sum_{k=1} \theta^k P(X = k)$
$f'(\theta) = E(\theta^X) = \sum k\theta^{k-1} P(X = k) \leftarrow$ differentiate wrt θ
mean $= \mu = f'(1) = \sum_k kP(X = k) \quad f(1) = \sum P(X = k) = 1$

$\{X_r^m\}$ = double series of random variables IID
X_{r+1}^m = the children in r+1 generation
$Z_{r+1}^m = X_1^m + ... + X_{Z_r}^m$ = sum of the children in r+1 generation

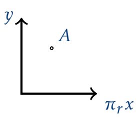
1.1 my example

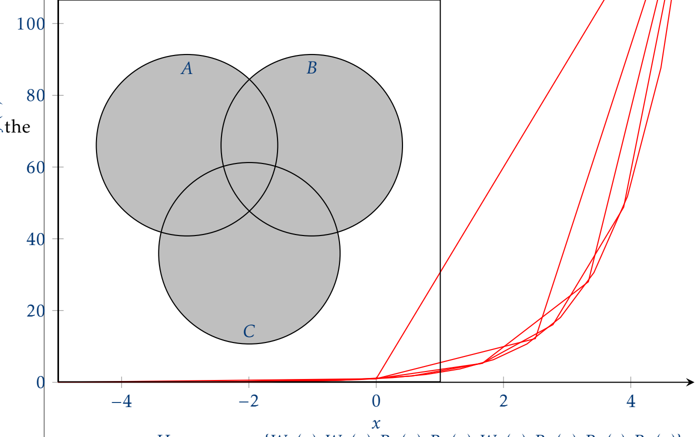


2 Chapter 0



3 Chapter 0





$$\begin{aligned} H_{1mmmmm} &= \{W_2(x), W_1(x), R_3(x), R_1(x), W_2(y), R_3(y), R_3(z), R_2(x)\} \\ H_{gggg2} &= \{R_3(z), R_3(y), W_2(y), R_2(z), W_1(x), R_3(x), W_2(x), R_1(x)\} \\ H_{3ggg} &= \{R_3(z), W_2(x), W_2(y), R_1(x), R_3(x), R_2(z), R_3(y), W_1(x)\} \\ H_{4g} &= \{R_2(z), W_2(x), W_2(y), W_1(x), R_1(x), R_3(x), R_3(z), R_3(y)\} \end{aligned} \tag{1}$$