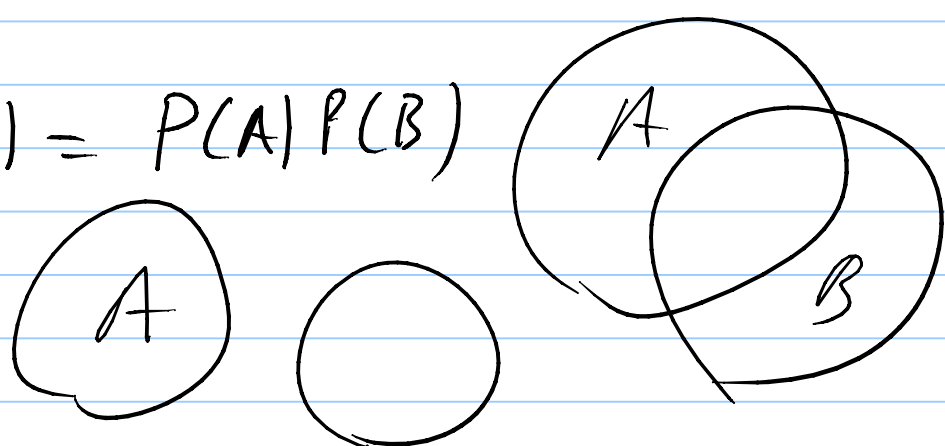
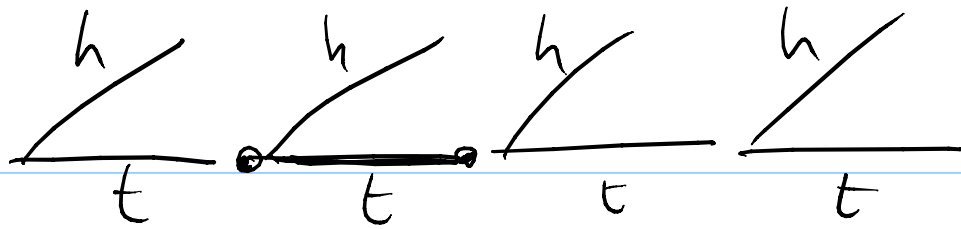


Set of measure zero

$\frac{1}{2} \quad \frac{1}{4} \quad \frac{1}{8} \dots$

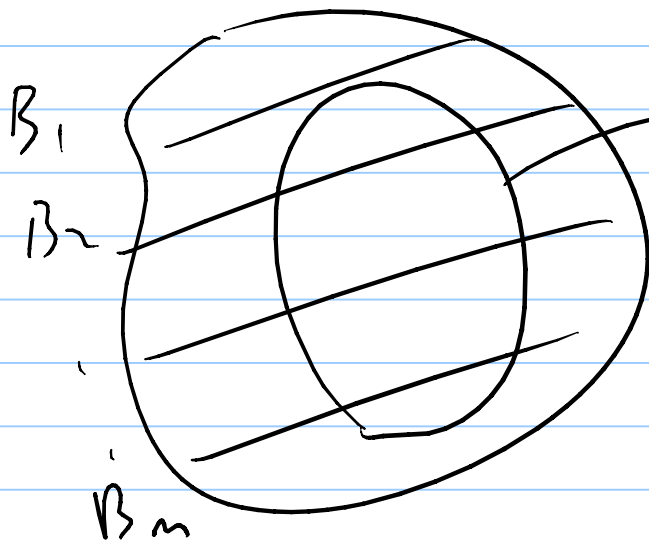
Indep  $P(AB) = P(A)P(B)$





$$P(\text{2nd coin is tail} \mid \text{1st is tail})$$

Total Prob law 
$$P(A) = \sum_{i=1}^n P(A|B_i)P(B_i)$$



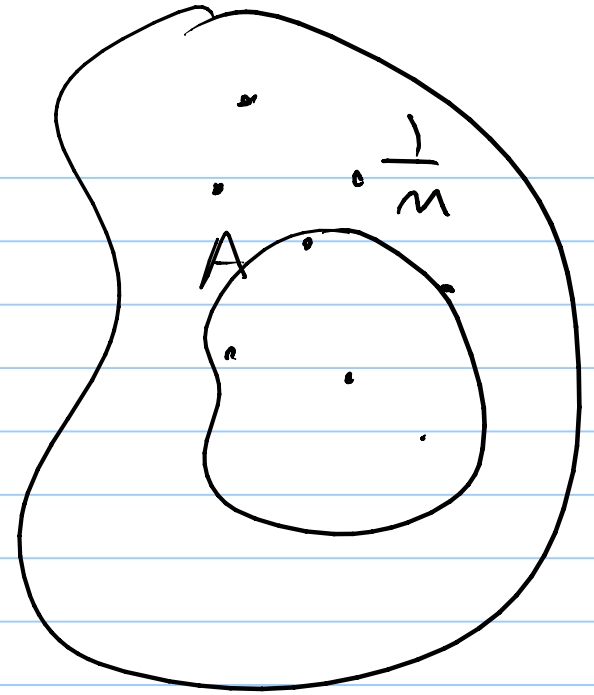
A Bayes rule

$$P(B_i|A) = \frac{P(A|B_i)P(B_i)}{\sum P(A|B_i)P(B_i)}$$

$$P = \frac{\# \text{ of cases of interest}}{\text{total \# of cases}} \\ \text{||} \\ \text{||} \\ m \text{ outcomes}$$

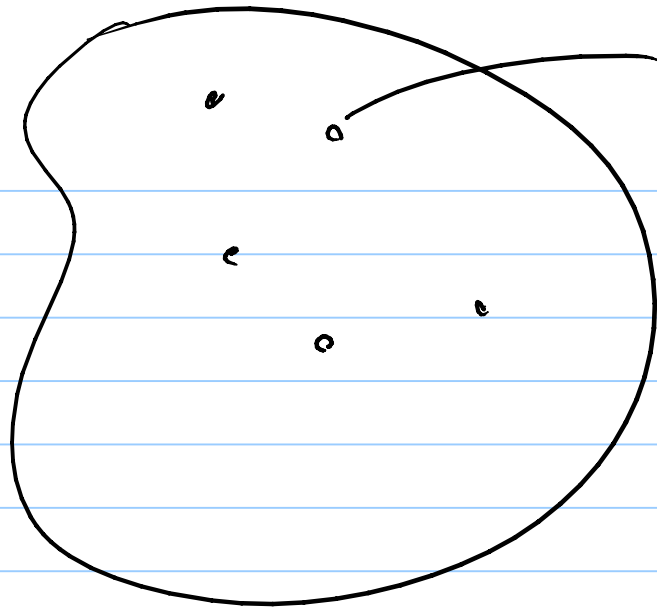
$$= \frac{1}{m} + \frac{1}{m} + \dots + \frac{1}{m}$$

$$= \frac{k}{m}$$



$$\binom{m}{k}, \binom{m}{k}, n^k, \binom{m}{k_1, k_2, \dots, k_m}$$

Indep trials

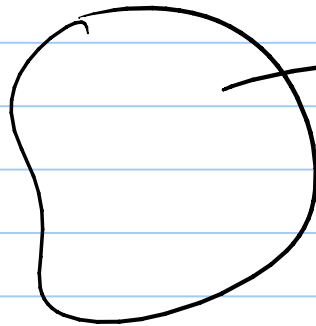


SSFF...S  
p

$$p^k (1-p)^{n-k}$$

k S's (n-k) F's

$$P(\text{there are } k \text{ successes}) = \binom{n}{k} p^k (1-p)^{n-k}$$



12361163...  
n

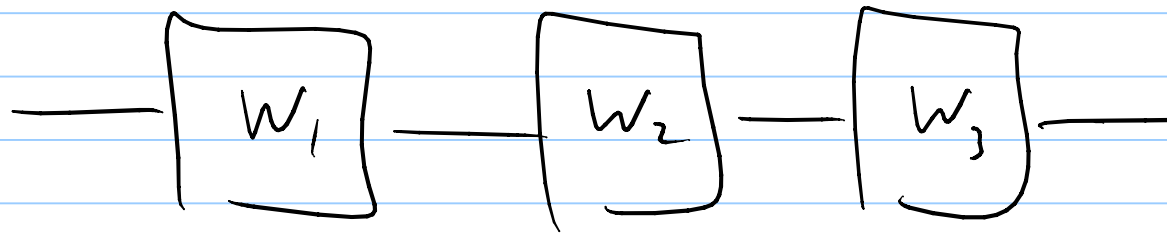
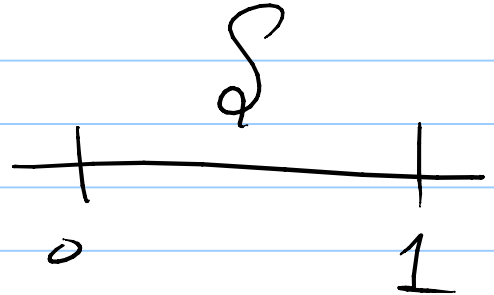
$p_1^{k_1} p_2^{k_2} \dots p_m^{k_m}$

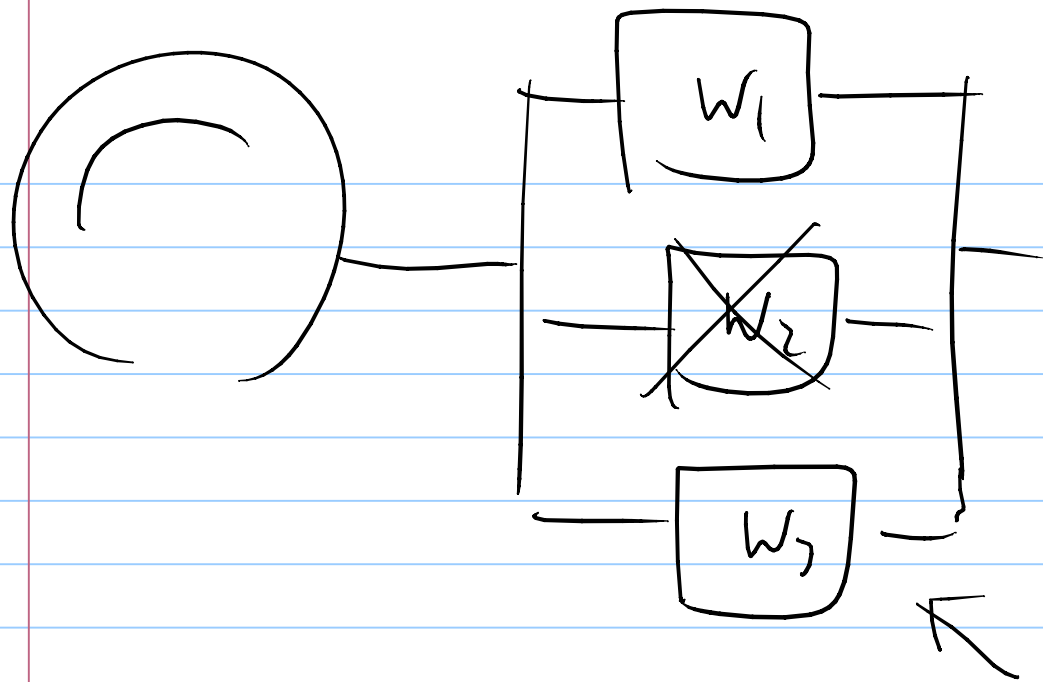
$P(\text{there are } k_1 \text{ 1's, } \dots, k_m \text{ m's})$

$$= \binom{n}{k_1, \dots, k_m} p_1^{k_1} \dots p_m^{k_m}$$

Infinite # trials

S 0.01110.....





01100010...

00011111000...

↓

1 Repetition code

$P(W_1)$      $P(W_i^c)$

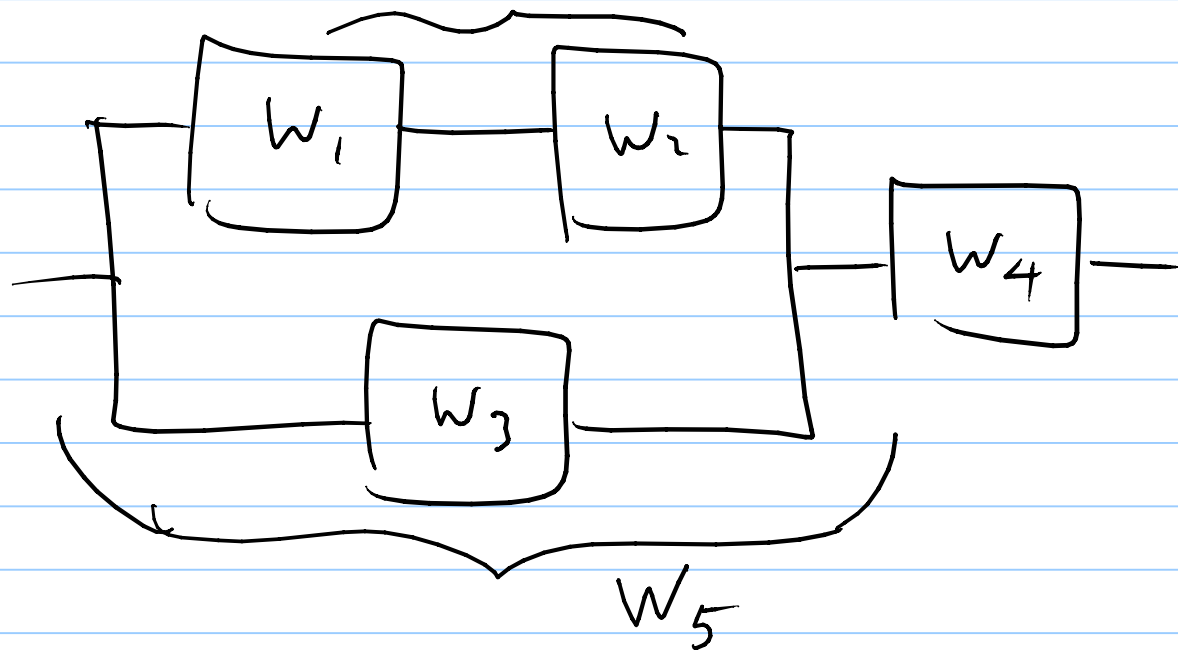
$$\begin{aligned}
 P(W \text{ series}) &= P(W_1 \cap W_2 \cap \dots) \\
 &= \prod P(W_i)
 \end{aligned}$$

$$P(W_{\text{parallel}}^c) = \prod_{i=1}^m P(W_i^c)$$

$$P(W_{\text{parallel}}) = 1 - P(W^c)$$

$$= 1 - \prod_{i=1}^m (1 - P(W_i))$$

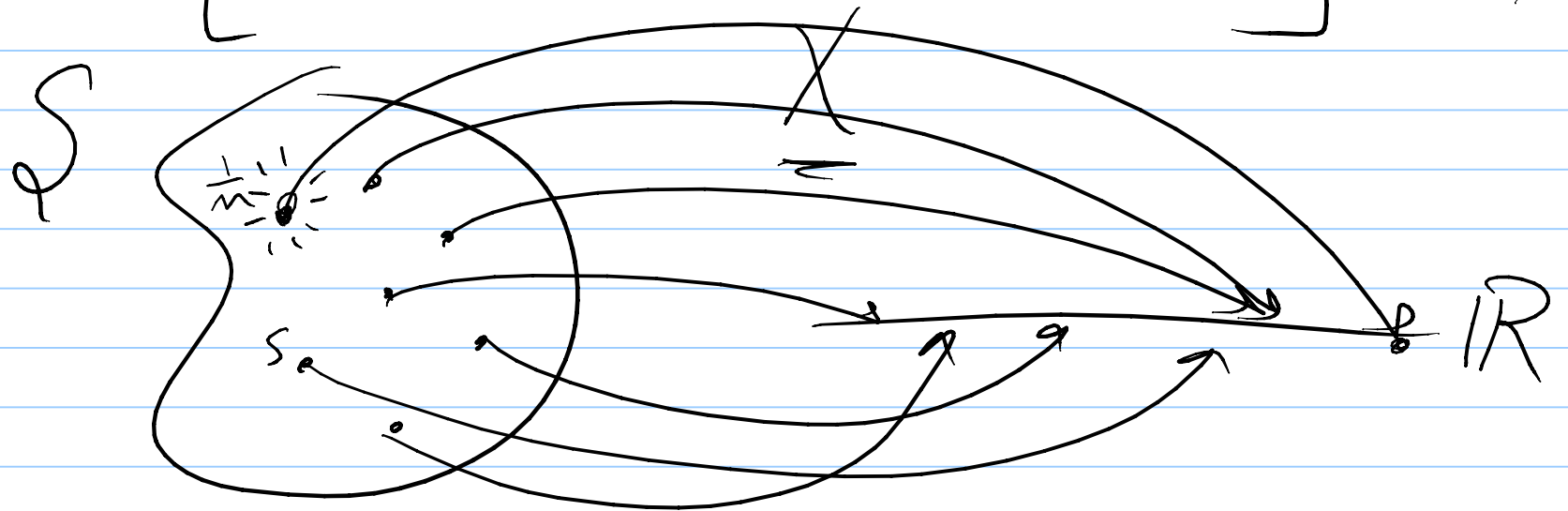
Example



$$P(W) = P(W_5)P(W_4)$$

$$P(W_5) = 1 - \underbrace{(1 - P(W_3))}_{= P(W_1)P(W_2)} \underbrace{(1 - P(W_6))}_{= P(W_1)P(W_2)}$$

$$P(W) = \left[ 1 - (1 - P(W_1)P(W_2))(1 - P(W_3)) \right] P(W_4)$$

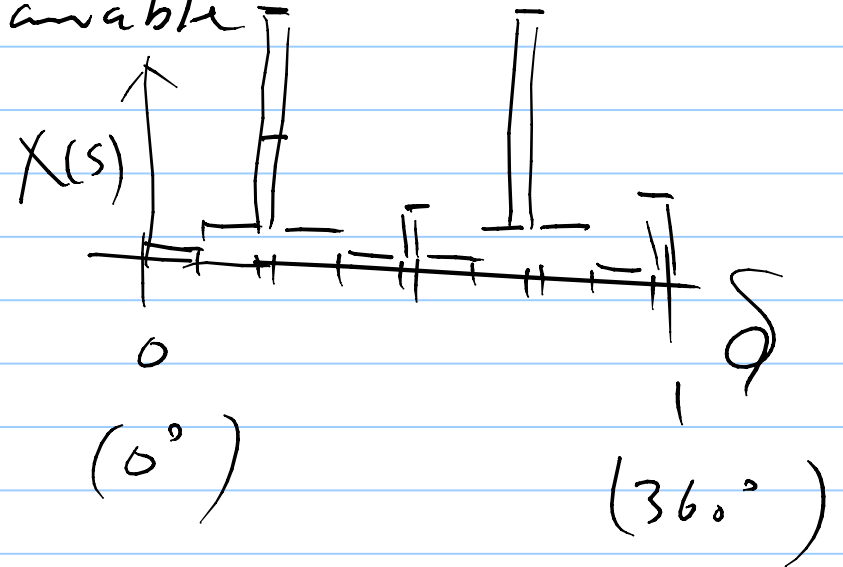
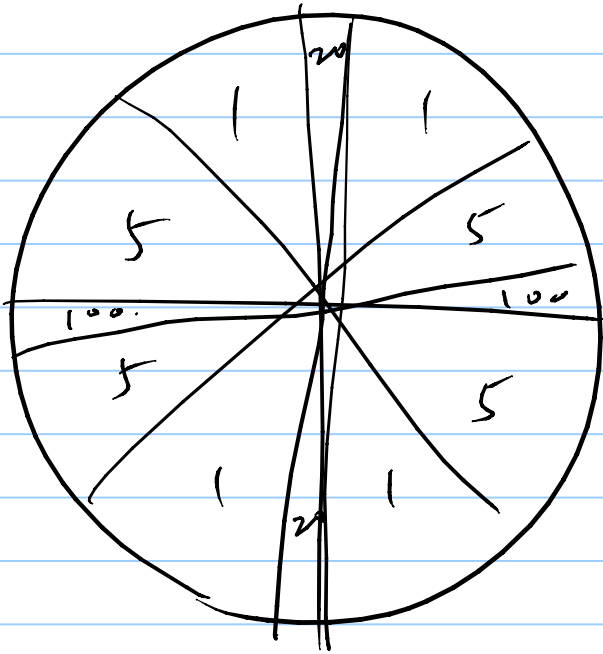




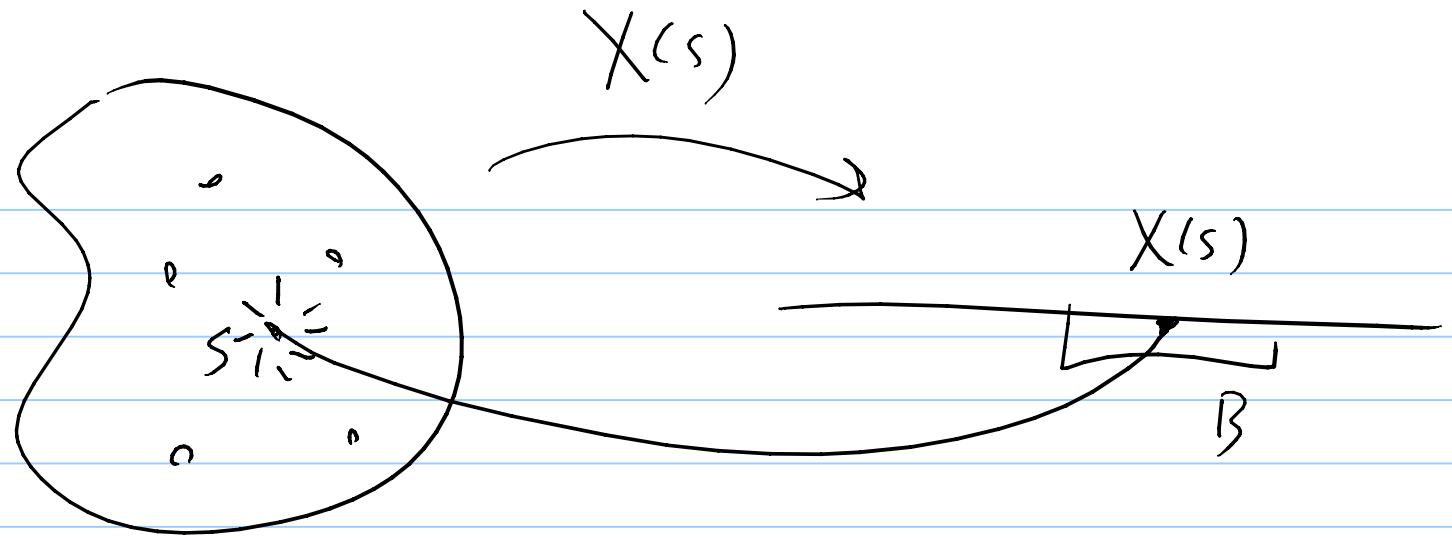
$$X(s) \Rightarrow X$$

$$y = f(x)$$

Random Variable



$$X(s) = e^s (R(\sqrt{s}))^{2F}$$

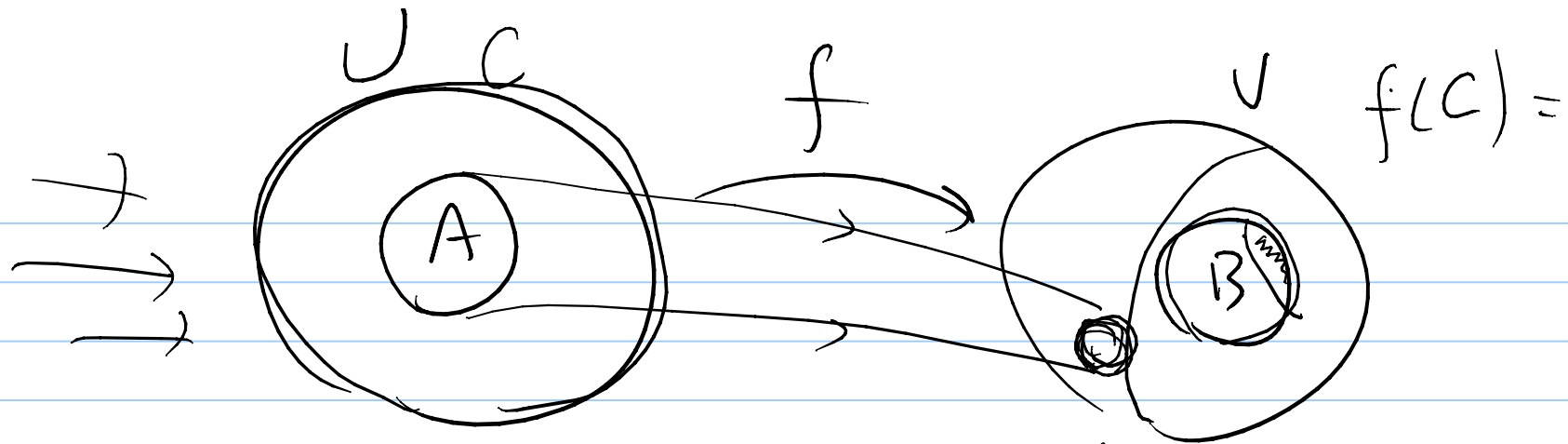


$$P(X \leq x) \triangleq P(\{s \mid X(s) \leq x\})$$

$$P(X \in B) \triangleq P(\{s \mid X(s) \in B\})$$

$$B = (-\infty, x] \\ 0.2$$

$$\underline{\underline{X^{-1}(B)}}$$



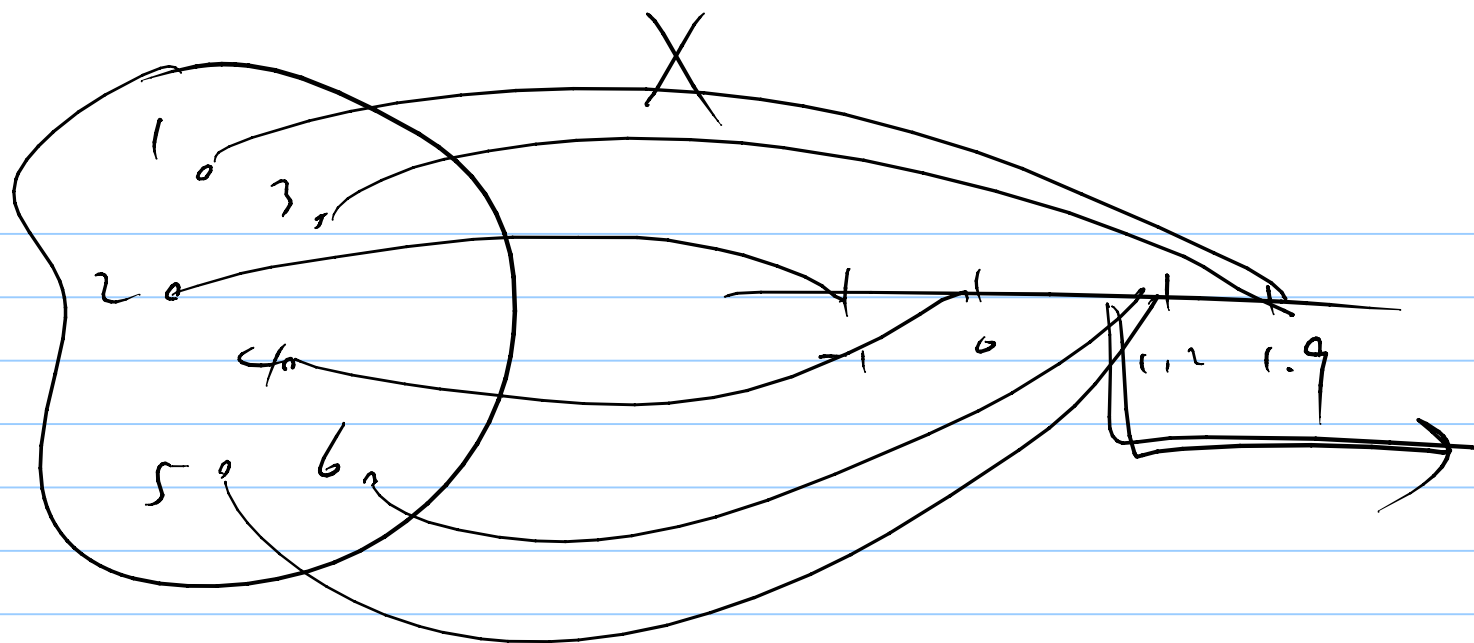
$$f(A) = \left\{ f(x) \in V \mid x \in A \right\}$$

image of  $A$   
rel to  $f$

$$\left\{ y \in V \mid y = f(x), x \in A \right\}$$

$$f^{-1}(B) = \left\{ x \in U \mid f(x) \in B \right\}$$

inverse image  
of  $B$  rel to  $f$



$$A = \{1, 2, 3\} \quad X(A) = \{-1, 1.9\}$$

$$B = \{x \mid x \geq 1\} \quad X^{-1}(B) = \{1, 3, 5, 6\}$$

$$\neq \{1, 3, 5\}$$

$$X(\{1, 3, 5\}) = \{1.2, 1.9\}$$

$$X(\{1, 3, 5, 6\}) \neq \{1.2, 1.9\}$$

~~1~~  
1

$$X(X^{-1}(B)) \neq B$$

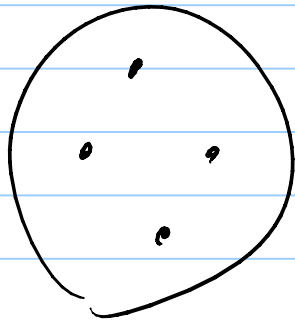
$$X(X^{-1}(B)) \subset B$$

$$X^{-1}(X(A)) \neq A$$

$$X^{-1}(X(A)) \supset A$$

$$\mathcal{S} = \mathbb{R}$$

$$X(s) = s$$



1, 5, 20, 100