

① Inverse sampling (easiest)

$$P(X) = \text{pdf}$$

$$x_1, x_2, \dots, x_n$$

$$P(X=x_i) = p_i$$

cdf = cumulated probability

$$F(x_1) = p_1$$

$$F(x_2) = p_1 + p_2$$

$$F(x_3) = p_1 + p_2 + p_3$$

continuous

$$F = \int_0^a f(x) dx$$

non-increasing
increasing

• choose $r = \text{unif}(0, 1)$ value

• compute inverse $F^{-1}(r)$

→ selected item/value

compute

① inverse with (cdf)

② Binary search

Sampling: From dist $\bar{P} = (p_1, p_2, \dots, p_n)$

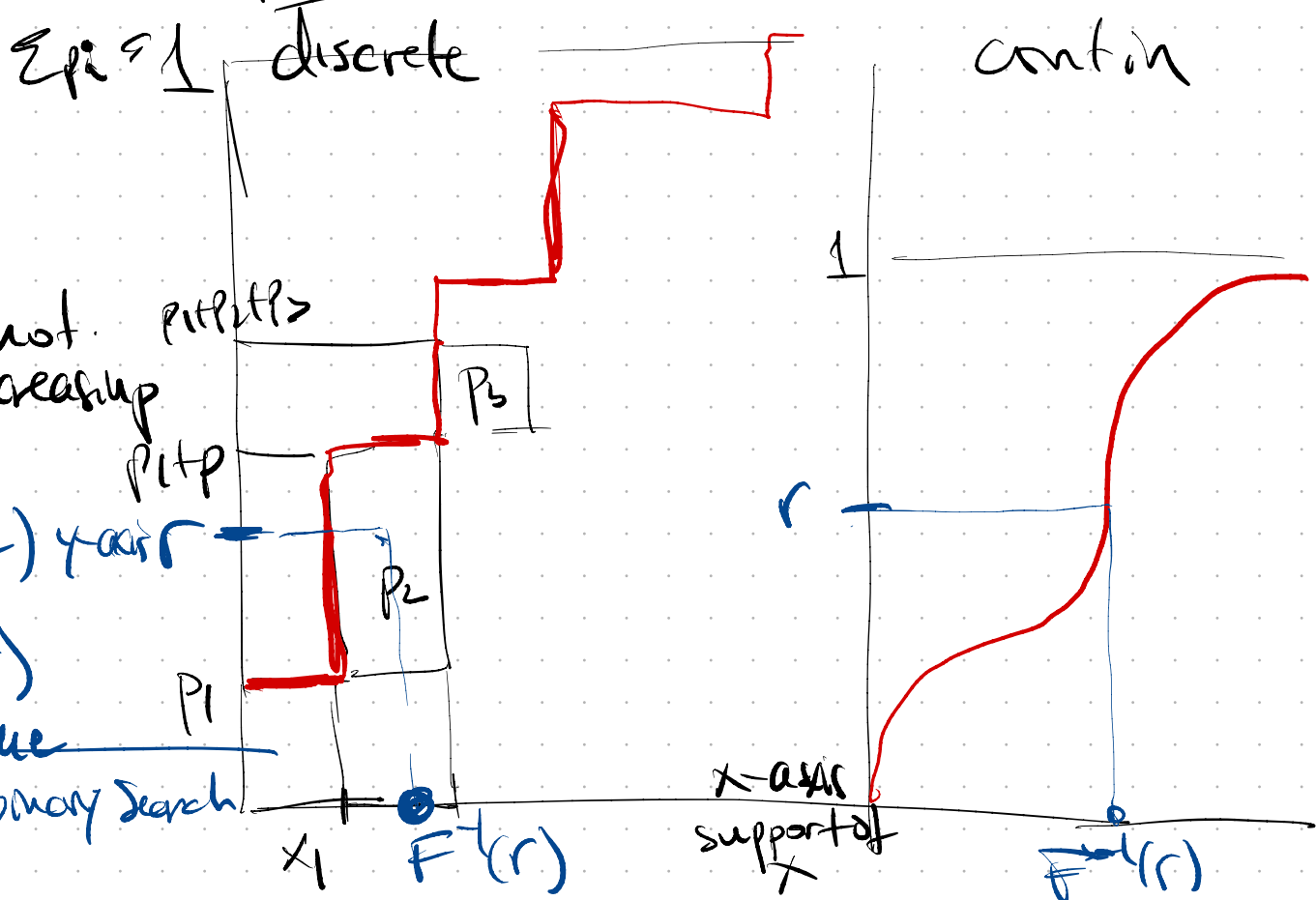
select item k with probas p_k

"outcome $X = R \cdot V \sim P$ "

P uniform \Rightarrow trivial to sample

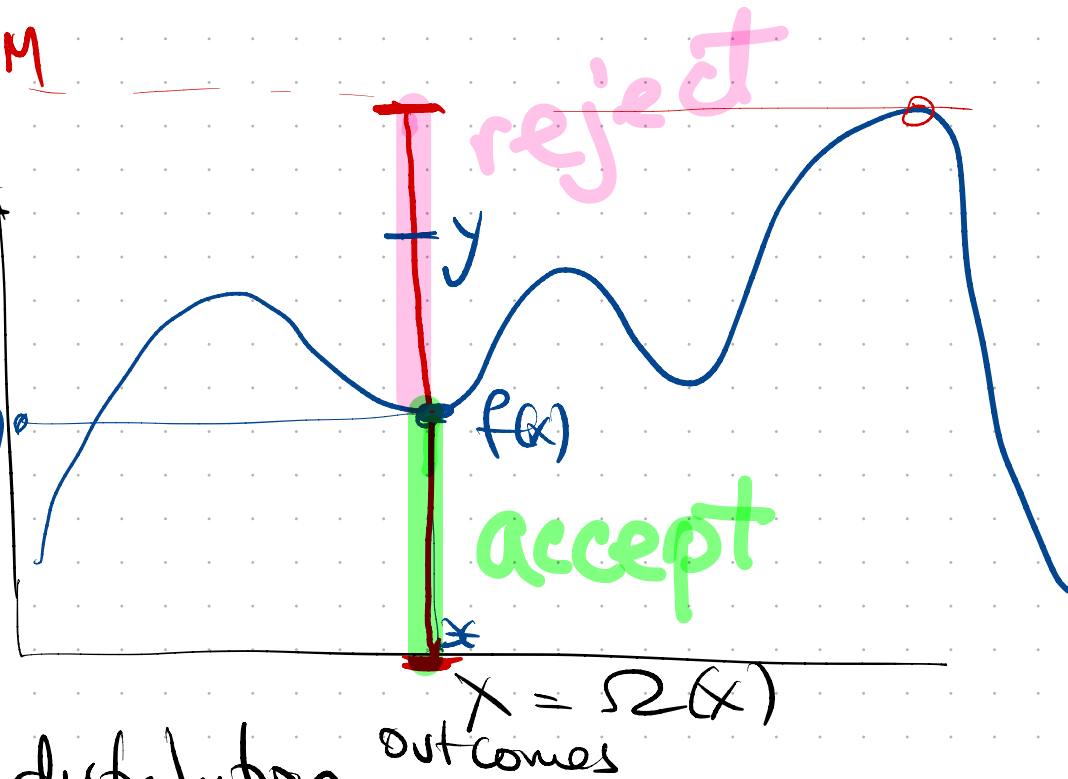
$P_i = \frac{1}{n}$ just an item with random

practice: shuffle $(1, 2, \dots, n)$ pick first



Rejection sampling (Accept-reject) $P = p d f(x)$

- sample $x \in \mathcal{R}(X)$ outcome
- look at vertical line $[0, M]$ on x Max M
- sample uniform $y \in [0, M]$ dens of $p(x)$
- if $y > f(x)$ reject x
- if $y \leq f(x)$ accept x
- repeat until accept (resample x)



general:

- sample x from g distribution
- $r = \text{uniform}(0, 1)$
- accept if $r < \frac{f(x)}{g(x)} \cdot M$
- repeat until accept

③ Sample K items ~~(100%)~~ ^{without repeat} non-unif dist. P_1, P_2, \dots, P_n

- not possible exact
- K large ($K \rightarrow n$) \Rightarrow all items will be selected (prob = 100%)
- $K \ll n$ we want prob $\approx p$

with repetition = prob
[- sample 1 item
[repeat K times

