

$$0 < \epsilon < \frac{1}{k}$$

$$\frac{n}{2k}$$

$$p = \frac{1}{n^{1-\epsilon}}$$

$$= n^{\epsilon-1}$$

$$\geq \frac{6k \log n}{n}$$

$$\leq \frac{n}{2}$$

$$\begin{aligned}
 E(X) &= E\left(\sum_{i=1}^n X_i \right) \\
 &= \sum_{i=1}^n E(X_i) \\
 &= \sum_{i=1}^n \frac{\binom{n}{i} p^i (1-p)^{n-i}}{2^i} \\
 &= \sum_{i=1}^n \frac{n \binom{n-1}{i-1} p^i (1-p)^{n-i}}{2^i} \\
 &= n p \sum_{i=1}^n \frac{\binom{n-1}{i-1} p^{i-1} (1-p)^{n-i}}{2^{i-1}} \\
 &= n p \sum_{j=0}^{n-1} \frac{\binom{n-1}{j} p^j (1-p)^{n-1-j}}{2^j} \\
 &= n p \cdot 1 \\
 &= n p
 \end{aligned}$$

The diagram illustrates the derivation of the expected value of a binomial random variable $X \sim G(n, p)$. It shows the transition from the sum of individual binomial distributions to the binomial distribution itself, and then to the final result np .

$$\underbrace{h^k p^k}_{\text{circle}} \Rightarrow \underbrace{h^i p^i}_{\text{bracket}} \checkmark$$

for $1 \leq i \leq k$

$$hp = h \frac{1}{h^{i-2}} = h^2 > 1 \checkmark$$

$$P(X \geq a) \leq \frac{E(X)}{a}$$

$$\begin{aligned} & (k-2) n^{k-1} P^k = (k-2) n^{k-1} \frac{1}{k-k\varepsilon} \\ \Sigma < \frac{1}{k} & = (k-2) n^{\boxed{k\varepsilon}-1} \triangleq (k-2) \frac{1}{n^{\ominus}} \end{aligned}$$

$$P_r \left(\exists \text{ a independent set of} \right. \\ \left. \text{cardinality } \geq \frac{n}{2k} \right)$$

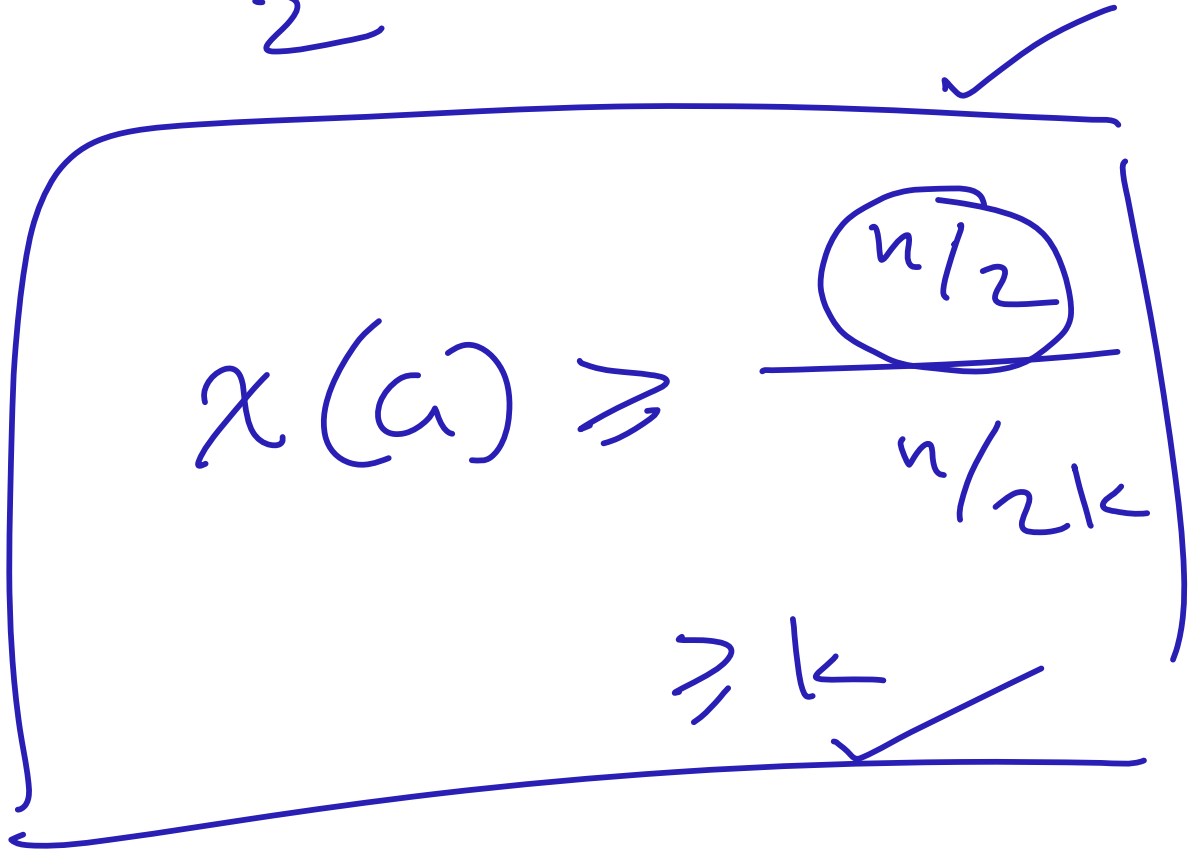
+

$$P_r \left(X \geq \frac{n}{2} \right) < \frac{1}{2}$$

~~or~~

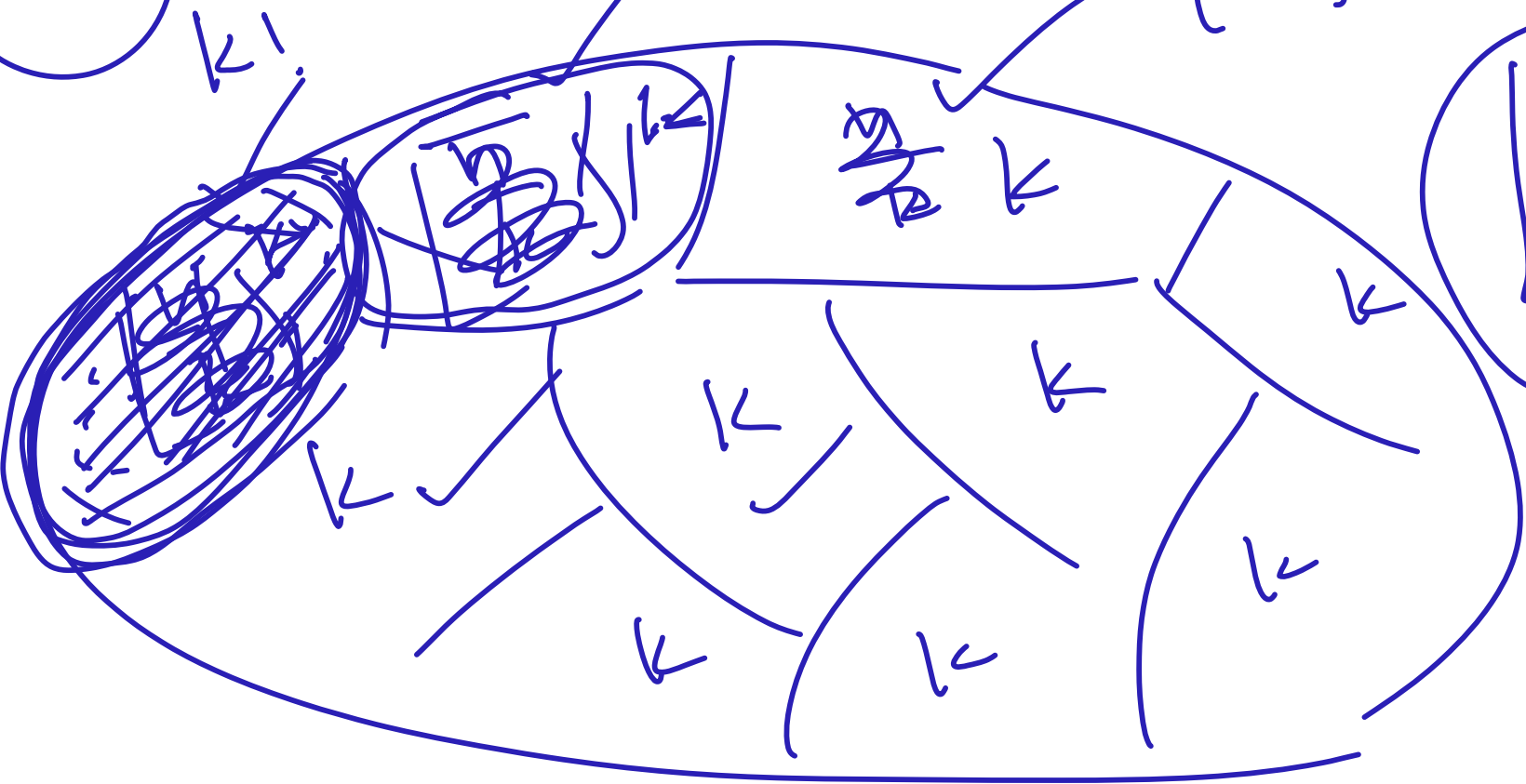
$$\leq \frac{h}{2k}$$

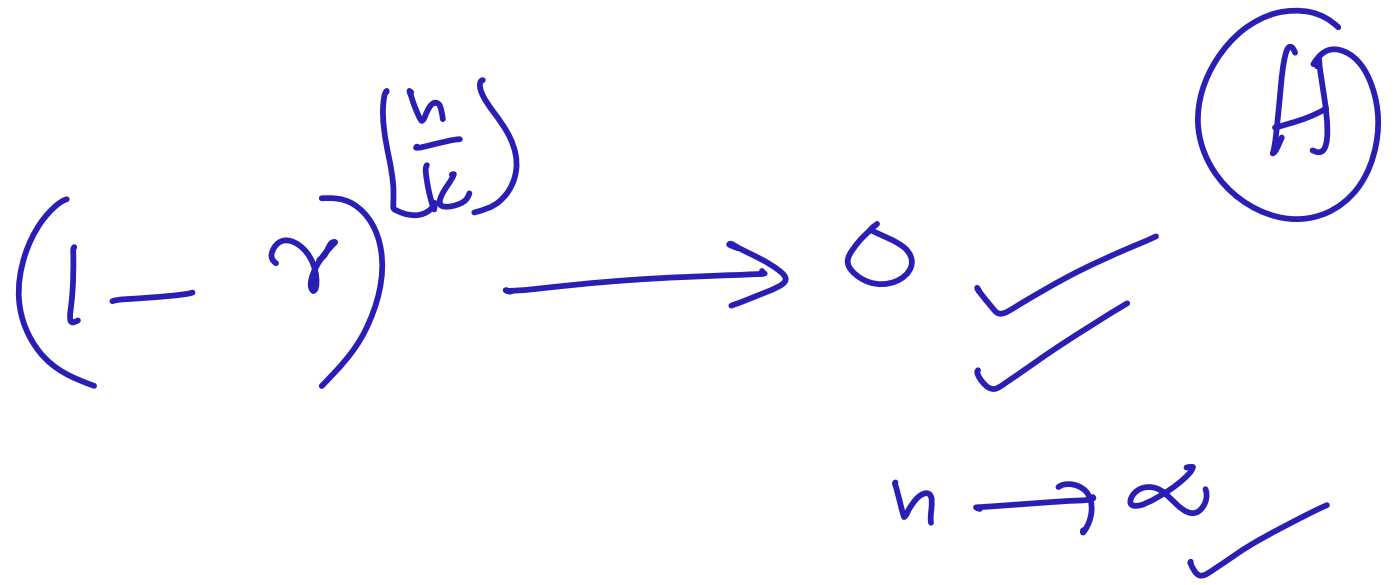
$$\frac{h}{2}$$



5

$$1, 2, \dots, 5$$
$$[H] = K$$





$$\lim_{n \rightarrow \infty} \frac{p(n)}{t(n)} \rightarrow 0 \quad \text{as } n \rightarrow \infty$$

$p(n)$ is slightly smaller than $t(n)$

$$P(a \notin \mathcal{P}) \Rightarrow 1$$

$$P(a \in \mathcal{P}) \rightarrow 0 \quad \checkmark$$

$$P(X \geq 1) \rightarrow 0$$

if $\frac{P}{t} \rightarrow 0$

$P(X \geq 1) \leq$

$$\frac{E(X)}{1} = \underline{E(X) \rightarrow 0}$$

$$\frac{p}{t} \rightarrow 1$$

$$p(x \geq 1) \rightarrow 1$$

$$p(x = 0) \rightarrow 0$$

$$\sigma^2 = E((X - \mu)^2)$$

$$= E(X^2 + \mu^2 - 2X\mu)$$

$$= E(X^2) + \mu^2 - 2E(X) \cdot \mu$$

$$= E(X^2) + \mu^2 - 2\mu^2$$

$$= E(X^2) - \underline{\underline{\mu^2}}$$

$$P(|X - \mu| > \lambda)$$

$$= P\left(\boxed{(X - \mu)^2} > \lambda^2\right)$$

q

t

$$E\left(\frac{(X - \mu)^2}{\sigma^2}\right)$$

σ^2

σ^2

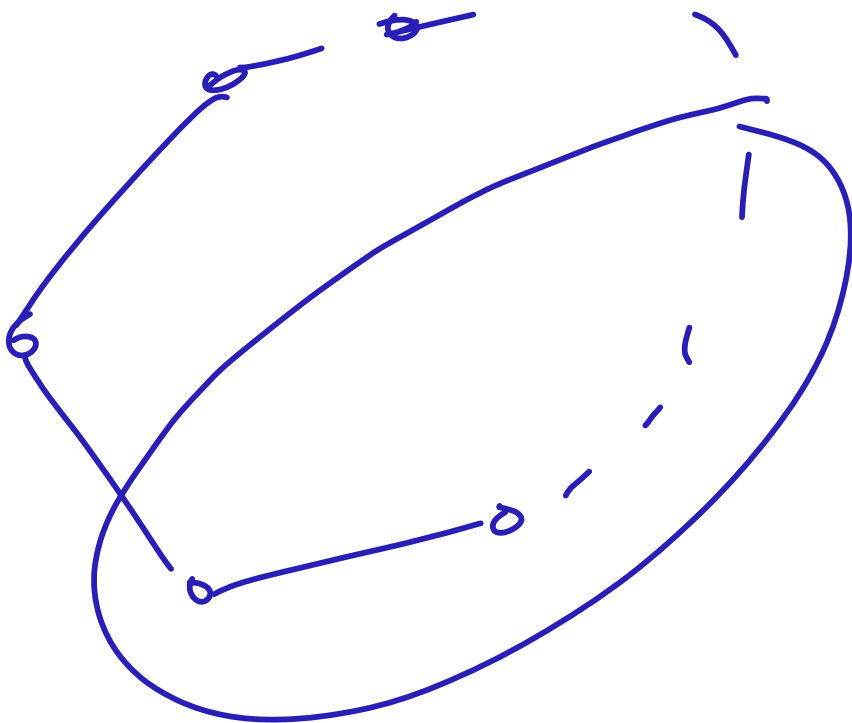
$$\Sigma(H) \stackrel{=} {=} \frac{|E(H)|}{|H|}$$

②

$$\Sigma(H) \leq \Sigma(H)$$

$$\frac{\cancel{k}}{\cancel{k} (k-1)/2}$$

$$\frac{2}{k-1}$$



$$\frac{k}{k-1}$$

✓