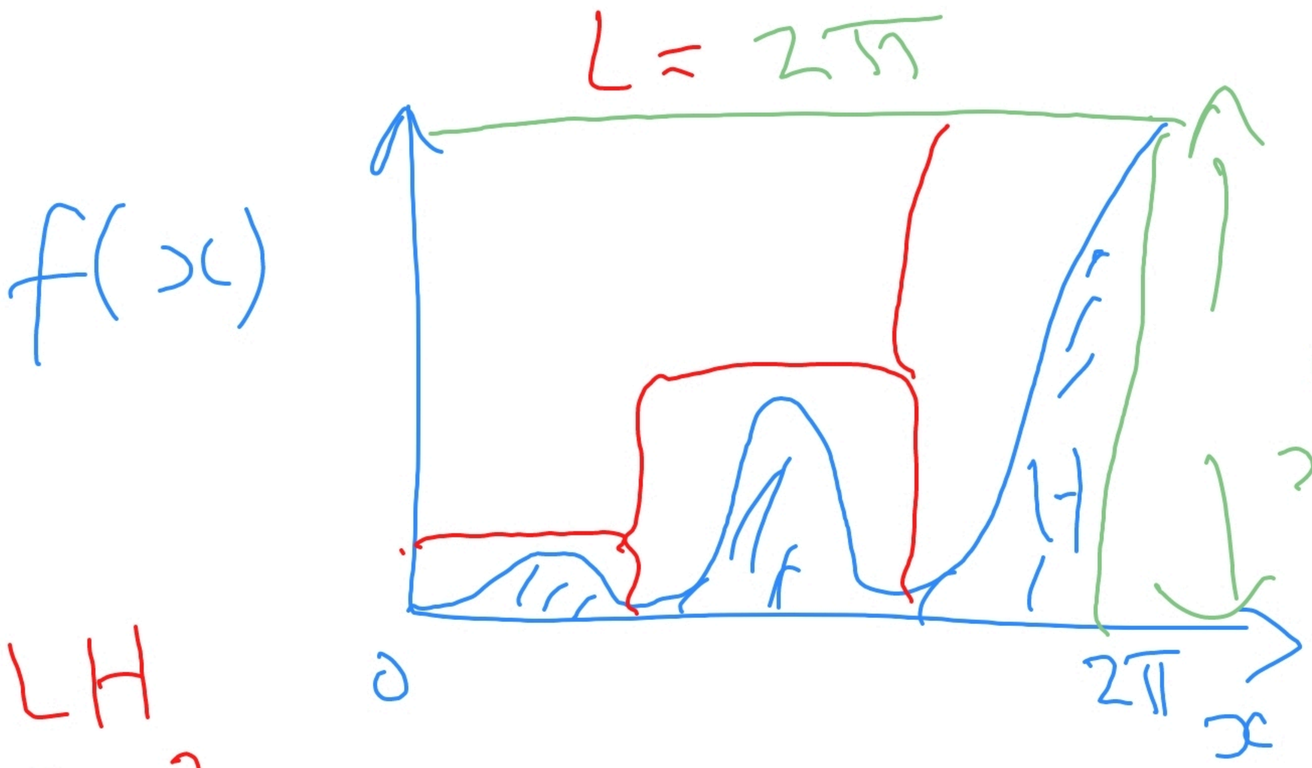
$$\int f(x)\,dx = \left(\frac{k}{N}\right) A$$

Hit and Miss



$$\max_{x\in[0,2\pi]} f(x) \qquad H = 4\pi^2$$

$$A = LH = 8\pi^3$$

$$x^2\cos^4 x$$

$$\hat{p} = \frac{k}{N}$$

$$k \sim Bi(N; p)$$

$$prob(k) = \binom{N}{k} p^k (1-p)^k$$

$$\sigma_k^2 = var(k) = N\hat{p}(1-\hat{p}) \qquad \hat{p} = \frac{k}{N}$$

$$\hat{I} = \hat{p} A$$

$$\sigma_{\hat{I}} = A \sigma_{\hat{p}} = A \frac{\sigma_k}{N}$$

$$I = \int f \, dV \approx V \langle f \rangle \pm \sigma_I$$

$$\sigma_I = V \sqrt{\frac{\langle f^2 \rangle - \langle f \rangle^2}{N}}$$

$$\left(\approx V \frac{\sigma_f}{\sqrt{N}} \right)$$