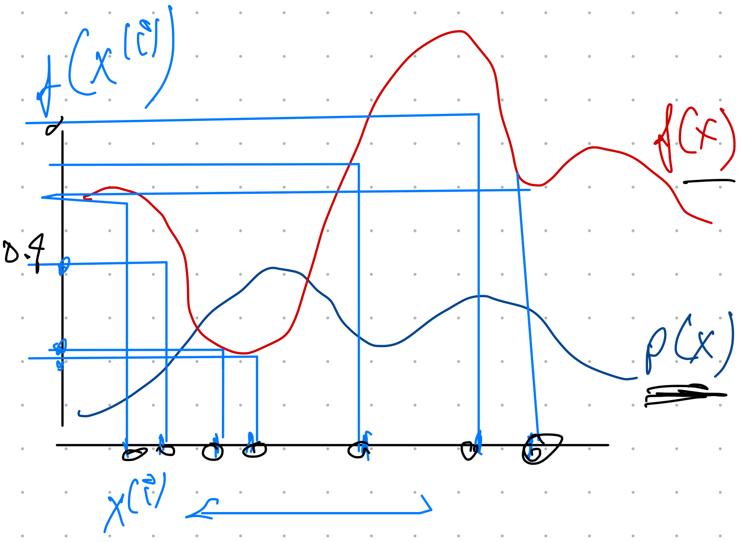
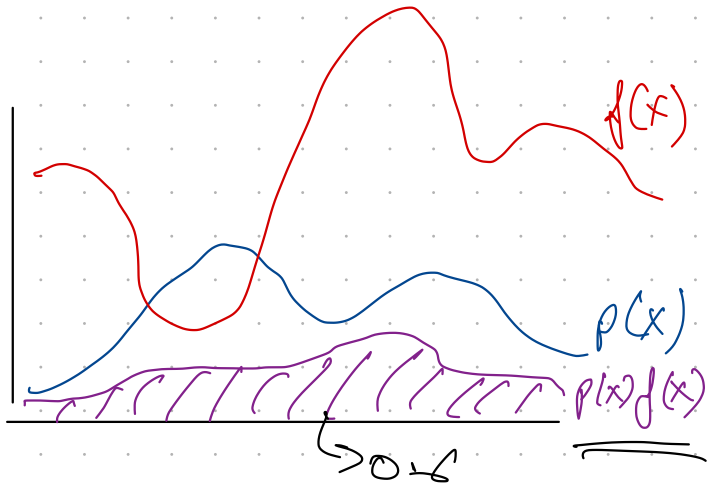
Importance sampling $E(X) = \int_{-\infty}^{\infty} p(x) \cdot x \cdot dx$

$$E[f(x)] = \int_{-\infty}^{\infty} p(x) f(x) dx$$





$$E(f(x)) \approx \frac{1}{N} \sum^{N} f(x^{(i)}) \quad , x^{(i)} \sim p(x)$$

$$E_p(f(x)) = \int p(x) f(x) dx$$

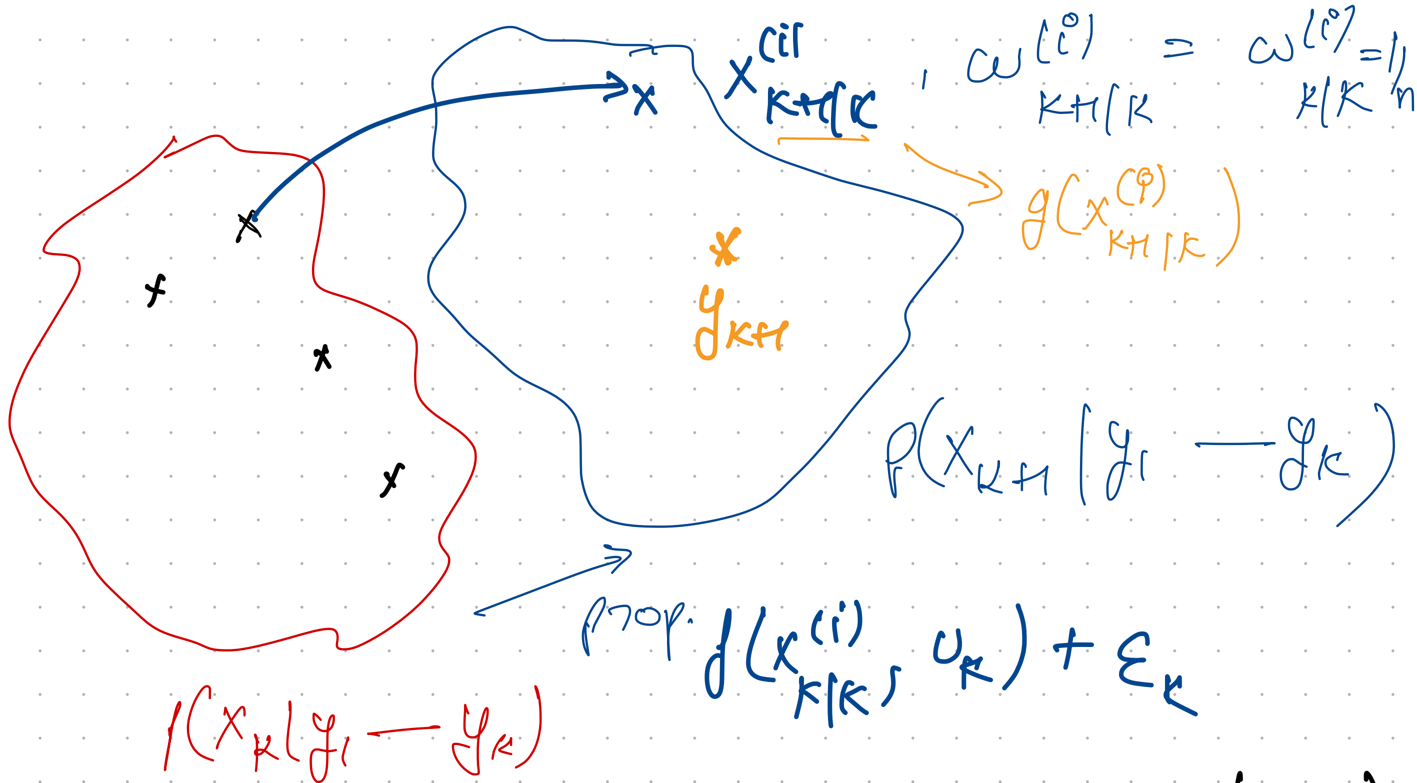
$$= \int p(x) f(x) \left(\frac{q(x)}{q(x)} \right) dx$$

$$= \int q(x) \left[\frac{p(x)}{q(x)} \cdot f(x) \right] dx$$

$$E_p(f(x)) = E_q\left[\frac{p(x)}{q(x)} \cdot f(x)\right]$$

$$\approx \frac{1}{N}\sum^{N} \frac{p(x^{(i)})}{q(x^{(i)})} f(x^{(i)}) \quad x^{(i)} \sim q(x)$$

$$\approx \frac{1}{N}\sum_{i=1}^{N} \underline{w^{(i)}} \cdot f(x^{(i)}) \quad \underline{x^{(i)}} \sim \underline{q(x)}$$



$$y_{k+1} = g(x^{(i)}_{k+1|k}) + v_k \quad v_k \sim N(0, Q)$$