$$P_\theta(\sigma) = \frac{1}{Z} e^{-H(\sigma)} . \quad P_g = \text{TRUE MEASURE.}$$

$$\mathbb{E}_{P_g}\left[\left\| \frac{P_\theta^-}{P_\theta^+} - \frac{P_g^-}{P_g^+} \right\|^2\right]$$

$$= \mathbb{E}_{P_g}\left[\left(\frac{P_\theta^-}{P_\theta^+}\right)^2 + k - 2\,\frac{P_\theta^-}{P_\theta^+}\,\frac{P_g^-}{P_g^+}\right]$$

$$= \sum_i P_g(\sigma_i)\left(\frac{P_\theta(-\sigma_i)}{P_\theta(\sigma_i)}\right)^2 - 2\sum_i \frac{P_\theta(-\sigma_i)}{P_\theta(\sigma_i)}\,\frac{P_g(-\sigma_i)}{P_g(\sigma_i)}\,P_g(\sigma_i)$$

$$= \mathbb{E}_g\left[\left(\frac{P_\theta(-\sigma_i)}{P_\theta(\sigma_i)}\right)^2\right] - 2\,\mathbb{E}_g\left[\frac{P_\theta(\sigma_i)}{P_\theta(-\sigma_i)}\right]$$

$$\mathbb{E}_g\left[\left\|\frac{\partial p_\theta}{p_\theta} - \frac{\partial p_g}{p_g}\right\|^2\right],$$

$$= \sum_i p_g(x_i)\left(\frac{\partial p_\theta(x_i)}{p_\theta(x_i)}\right)^2 - 2\sum_i \frac{\partial p_\theta(x_i)}{p_\theta(x_i)}\,\frac{\partial p_g(x_i)}{\cancel{p_g(x_i)}}\,\cancel{p_g(x_i)}$$

$$I = \mathbb{E}_g\left(\frac{\partial p_\theta}{p_\theta}\right)^2 - 2\,\mathbb{E}_g\frac{\partial p_\theta}{p_\theta} - 2\,\mathbb{E}_g\frac{\partial p_\theta}{p_\theta}$$

$$\mathrm{II} = \mathbb{E}_g\left[\left(\frac{\delta p_\theta}{p_\theta}\right)^2\right]$$

$$-2\sum_i \left(\frac{p_\theta(x_i) - p_{\bar\theta}(x_i)}{p_\theta(x_i)}\right)\delta p_g(x_i)$$

$$= \lambda - 2\left(\sum_i \cancel{\frac{p_\theta(x_i)}{p_\theta(x_i)}}\,\delta p_g(x_i) - \sum_i \frac{p_{\bar\theta}(x_i)\,\delta p_g(x_i)}{p_\theta(x_i)}\right)$$

$$= k + 2\sum_i \frac{p_\theta(-x_i)}{p_\theta(x_i)}\, p_g(x_i) - 2\sum_i \frac{p_\theta(-x_i)}{p_\theta(x_i)}\, p_g(-x_i)$$

$$= k + 2\,\mathbb{E}_g\left(\frac{p_{\bar\theta}}{p_\theta}\right) - 2\,\mathbb{E}_g\left(\frac{p_\theta}{p_{\bar\theta}}\right)$$