

Taylor series expansion

$$f(x) = f(a) + (x-a) \left. \frac{df}{dx} \right|_{x=a} + \frac{(x-a)^2}{2!} \left. \frac{d^2 f}{dx^2} \right|_{x=a} + \dots$$

Let $x = a - \varepsilon$ and $\left. \frac{df}{dx} \right|_{x=a} = f'(a)$

$$f(a - \varepsilon) = f(a) - \varepsilon f'(a) + \frac{\varepsilon^2}{2!} f''(a) + \dots$$

Boltzmann Factor (canonical ensemble)

$$P(\varepsilon) \propto e^{\frac{-\varepsilon}{k_B T}}$$