

$$I = 2\sigma^4 = \int_0^\infty dx \, x^3 \exp\left(-\frac{1}{2} \frac{x^2}{\sigma^2}\right) = \int_0^\infty dx \, f(x) \text{pdf}(x) \approx \frac{1}{N} \sum_{i=1}^N f(x_i)$$

$$\text{with: } f(x) = \sigma \sqrt{\frac{\pi}{2}} x^3; \text{ pdf}(x) = \begin{cases} \frac{1}{\sigma} \sqrt{\frac{2}{\pi}} \exp\left(-\frac{1}{2} \frac{x^2}{\sigma^2}\right) & \text{if } x \geq 0 \\ 0 & \text{if } x < 0 \end{cases}$$

