

Let X be a continuous random variable with pdf $f(x)$.

EXPECTED VALUE OF X :

$$\mu = E(X) = \int_{-\infty}^{\infty} x f(x) dx$$

\uparrow values \uparrow probabilities

sums \Rightarrow integrals

... OF $h(X)$:

$$E(h(X)) = \int_{-\infty}^{\infty} h(x) f(x) dx$$

VARIANCE OF X :

$$\begin{aligned} \text{Var}(X) &= E[(X-\mu)^2] = \int_{-\infty}^{\infty} (x-\mu)^2 f(x) dx \\ &= E(X^2) - E(X)^2 \end{aligned}$$

MOMENT GENERATING FUNCTION:

$$M_X(t) = E(e^{tX}) = \int_{-\infty}^{\infty} e^{tx} f(x) dx$$