Dirac δ function: $\delta(x)$

$$\delta(x) = \begin{cases} \infty, & x = 0 \\ 0, & x \neq 0 \end{cases}$$

$$\forall \epsilon > 0,\ f(a) \text{ is defined as : } \quad \int_{a-\epsilon}^{a+\epsilon} f(x)\delta(x-a)\,\mathrm{d}x = f(a)$$

$$\int_{0^-}^{0^+} \delta(x)\,\mathrm{d}x = \frac{1}{2}$$

$$\int_{-\infty}^{\infty} \delta(x)\,\mathrm{d}x = 1$$