$\boxed{14}$ $X \in N(\mu, \sigma^2)$

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} \exp\left(-\frac{(x-\mu)^2}{2\sigma^2}\right) \quad x \in (-\infty, +\infty)$$

$$F(x) = \int_{-\infty}^{x} f(\eta)\, d\eta = \int_{-\infty}^{x} \frac{1}{\sigma\sqrt{2\pi}} \exp\left(-\frac{(\eta-\mu)^2}{2\sigma^2}\right) d\eta = (1)$$

$$\xi^2 = \frac{(\eta-\mu)^2}{2\sigma^2} = \left(\frac{\eta-\mu}{\sqrt{2}\sigma}\right)^2 \Leftrightarrow \xi = \pm \frac{\eta-\mu}{\sqrt{2}\sigma} \Rightarrow$$

$$\Rightarrow \xi = \frac{\eta-\mu}{\sqrt{2}\sigma}$$

$$\lim_{\eta \to -\infty} \xi = \lim_{\eta \to -\infty} \frac{\eta-\mu}{\sqrt{2}\sigma} = -\infty$$

$$(\xi)_{\eta=x} = \left(\frac{\eta-\mu}{\sqrt{2}\sigma}\right)_{\eta=x} = \frac{x-\mu}{\sqrt{2}\sigma}$$

$$d\xi = d\left(\frac{\eta-\mu}{\sqrt{2}\sigma}\right) = \frac{1}{\sqrt{2}\sigma} d(\eta-\mu) = \frac{1}{\sqrt{2}\sigma} d\eta \Leftrightarrow d\eta = \sqrt{2}\sigma\, d\xi$$

$$\frac{1}{\sigma\sqrt{2\pi}} e^{-\xi^2} \sqrt{2}\sigma\, d\xi = \frac{1}{\sqrt{\pi}} e^{-\xi^2} d\xi$$

$$(1) = \int_{-\infty}^{\frac{x-\mu}{\sqrt{2}\sigma}} \frac{1}{\sqrt{\pi}} e^{-\xi^2} d\xi = \frac{1}{\sqrt{\pi}} \int_{-\infty}^{\frac{x-\mu}{\sqrt{2}\sigma}} e^{-\xi^2} d\xi =$$

$$= \frac{1}{\sqrt{\pi}} \left(\int_{-\infty}^{0} e^{-\xi^2} d\xi + \int_{0}^{\frac{x-\mu}{\sqrt{2}\sigma}} e^{-\xi^2} d\xi \right) = (2)$$

$$\int_{-\infty}^{0} e^{-\xi^2} d\xi = -\int_{0}^{-\infty} e^{-\xi^2} d\xi = \int_{0}^{-\infty} e^{-\xi^2} (-d\xi) = \int_{0}^{-\infty} e^{-(-\xi)^2} d(-\xi) =$$

$$= \int_{0}^{+\infty} e^{-\xi^2} d\xi = \frac{\sqrt{\pi}}{2}$$

$$\int_{0}^{\frac{x-\mu}{\sqrt{2}\sigma}} e^{-\xi^2} d\xi = \frac{\sqrt{\pi}}{2} \frac{2}{\sqrt{\pi}} \int_{0}^{\frac{x-\mu}{\sqrt{2}\sigma}} e^{-\xi^2} d\xi = (3)$$

$$\operatorname{erf}(x) := \frac{2}{\sqrt{\pi}} \int_{0}^{x} e^{-\xi^2} d\xi$$

$$(3) = \frac{\sqrt{\pi}}{2} \operatorname{erf}\left(\frac{x-\mu}{\sqrt{2}\sigma}\right)$$

$$(2) = \frac{1}{\sqrt{\pi}} \left[\frac{\sqrt{\pi}}{2} + \frac{\sqrt{\pi}}{2} \operatorname{erf}\left(\frac{x-\mu}{\sqrt{2}\sigma}\right) \right] = \frac{1}{2} \left[1 + \operatorname{erf}\left(\frac{x-\mu}{\sqrt{2}\sigma}\right) \right]$$

$$\boxed{\begin{aligned} f(x) &= \frac{1}{\sigma\sqrt{2\pi}} \exp\left(-\frac{(x-\mu)^2}{2\sigma^2}\right) \\ F(x) &= \int_{-\infty}^{x} f(x)\,dx = \frac{1}{2}\left[1 + \operatorname{erf}\left(\frac{x-\mu}{\sqrt{2}\sigma}\right)\right] \end{aligned}}$$