

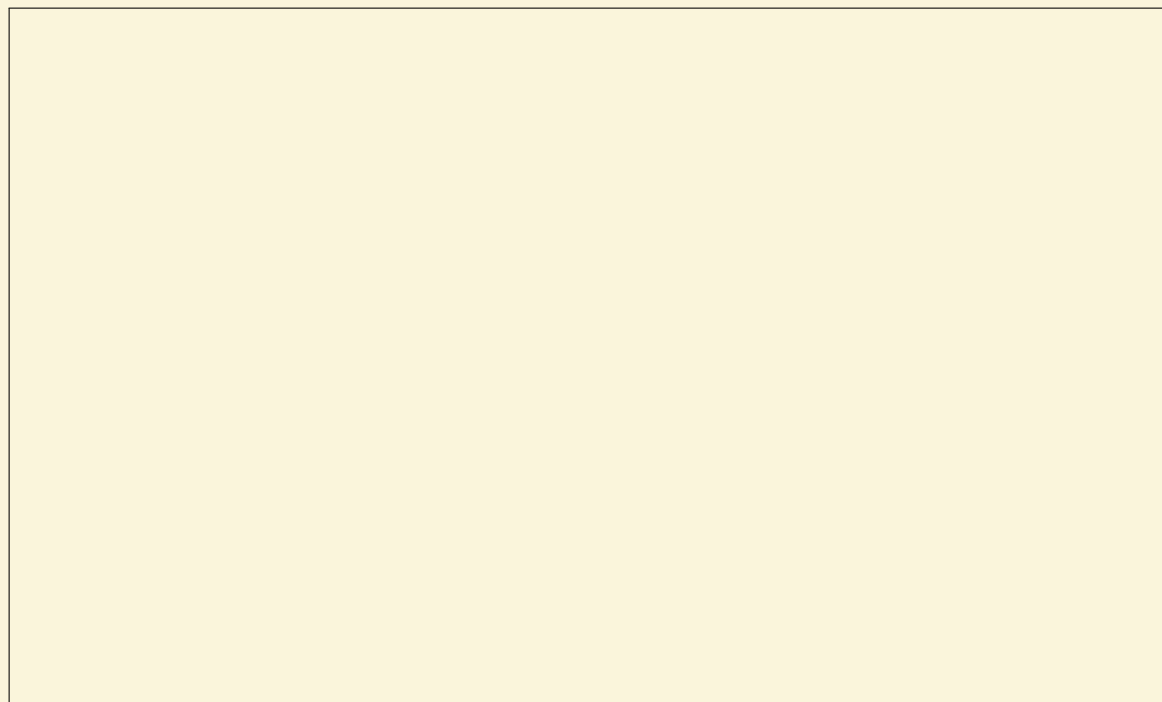
$Z = \sigma X + \mu$ har fordelingsfunktionen

$$F(x) = \Phi\left(\frac{x - \mu}{\sigma}\right) = \frac{1}{\sigma\sqrt{2\pi}} \int_{-\infty}^x e^{-\frac{1}{2}\left(\frac{v-\mu}{\sigma}\right)^2} dv$$

$X \sim N(0,1)$ har fordelingsfunktionen

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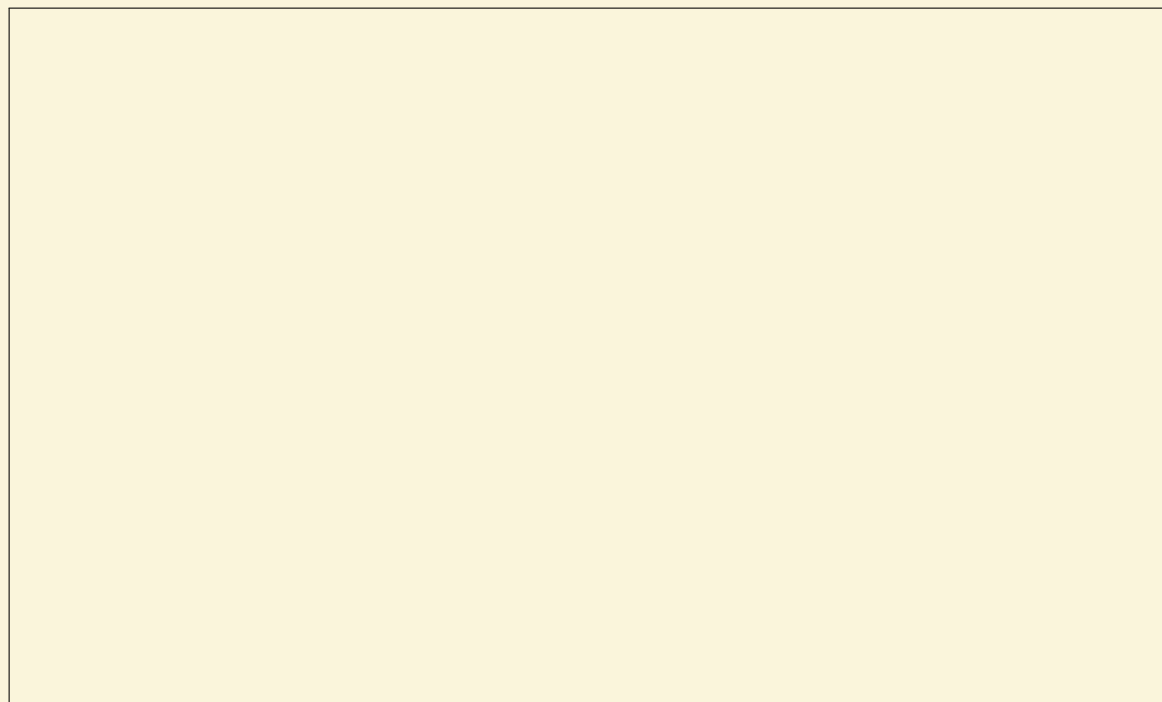
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$v = \sigma t + \mu$ og derfor er $\frac{dv}{dt} = \sigma$ og ved isolering af dt fås, at

$$dt = \frac{1}{\sigma} dv$$

$$\begin{aligned} \Phi\left(\frac{x - \mu}{\sigma}\right) &= \frac{1}{\sqrt{2\pi}} \int_{t=-\infty}^{t=\frac{x-\mu}{\sigma}} e^{-\frac{1}{2}t^2} dt \\ &= \frac{1}{\sqrt{2\pi}} \int_{t=-\infty}^{t=\frac{x-\mu}{\sigma}} e^{-\frac{1}{2}\left(\frac{v-\mu}{\sigma}\right)^2} \frac{1}{\sigma} dv \end{aligned}$$

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$$v = \sigma t + \mu$$

Da $v = \sigma t + \mu$ kan t isoleres.

$$v = \sigma t + \mu \Leftrightarrow v - \mu = \sigma t \Leftrightarrow \frac{v - \mu}{\sigma} = t$$

$$\begin{aligned} \Phi\left(\frac{x - \mu}{\sigma}\right) &= \frac{1}{\sqrt{2\pi}} \int_{t=-\infty}^{t=\frac{x-\mu}{\sigma}} e^{-\frac{1}{2}t^2} dt \\ &= \frac{1}{\sqrt{2\pi}} \int_{t=-\infty}^{t=\frac{x-\mu}{\sigma}} e^{-\frac{1}{2}\left(\frac{v-\mu}{\sigma}\right)^2} \frac{1}{\sigma} dv \end{aligned}$$

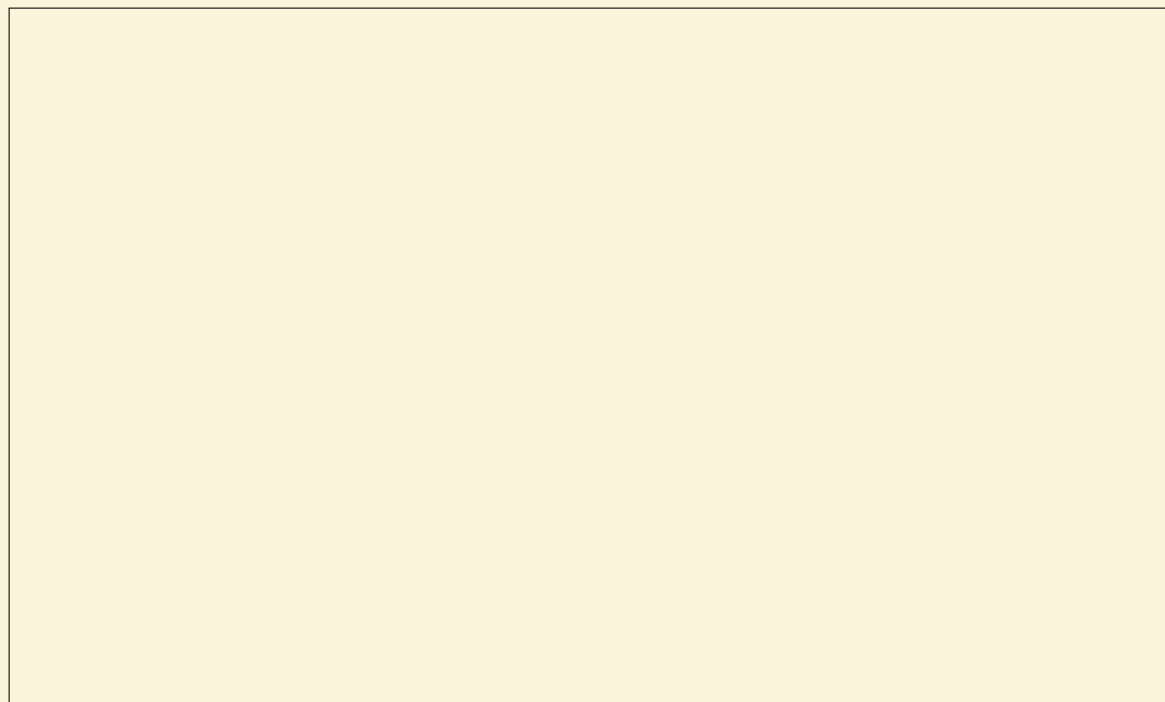
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Den nedre grænse $t = -\infty$ og da σ positiv vil også $v = \sigma t + \mu = -\infty$. Den øvre grænse er $t = \frac{x - \mu}{\sigma}$. Dette indsættes i $v = \sigma t + \mu$, for at beregne den tilsvarende v -værdi.

$$v = \sigma \frac{x - \mu}{\sigma} + \mu = x - \mu + \mu = x$$

$$\begin{aligned} \Phi\left(\frac{x - \mu}{\sigma}\right) &= \frac{1}{\sqrt{2\pi}} \int_{t=-\infty}^{t=\frac{x-\mu}{\sigma}} e^{-\frac{1}{2}t^2} dt \\ &= \frac{1}{\sqrt{2\pi}} \int_{t=-\infty}^{t=\frac{x-\mu}{\sigma}} e^{-\frac{1}{2}\left(\frac{v-\mu}{\sigma}\right)^2} \frac{1}{\sigma} dv \\ &= \frac{1}{\sigma\sqrt{2\pi}} \int_{t=-\infty}^{t=\frac{x-\mu}{\sigma}} e^{-\frac{1}{2}\left(\frac{v-\mu}{\sigma}\right)^2} dv \\ &= \frac{1}{\sigma\sqrt{2\pi}} \int_{v=-\infty}^{v=x} e^{-\frac{1}{2}\left(\frac{v-\mu}{\sigma}\right)^2} dv \end{aligned}$$