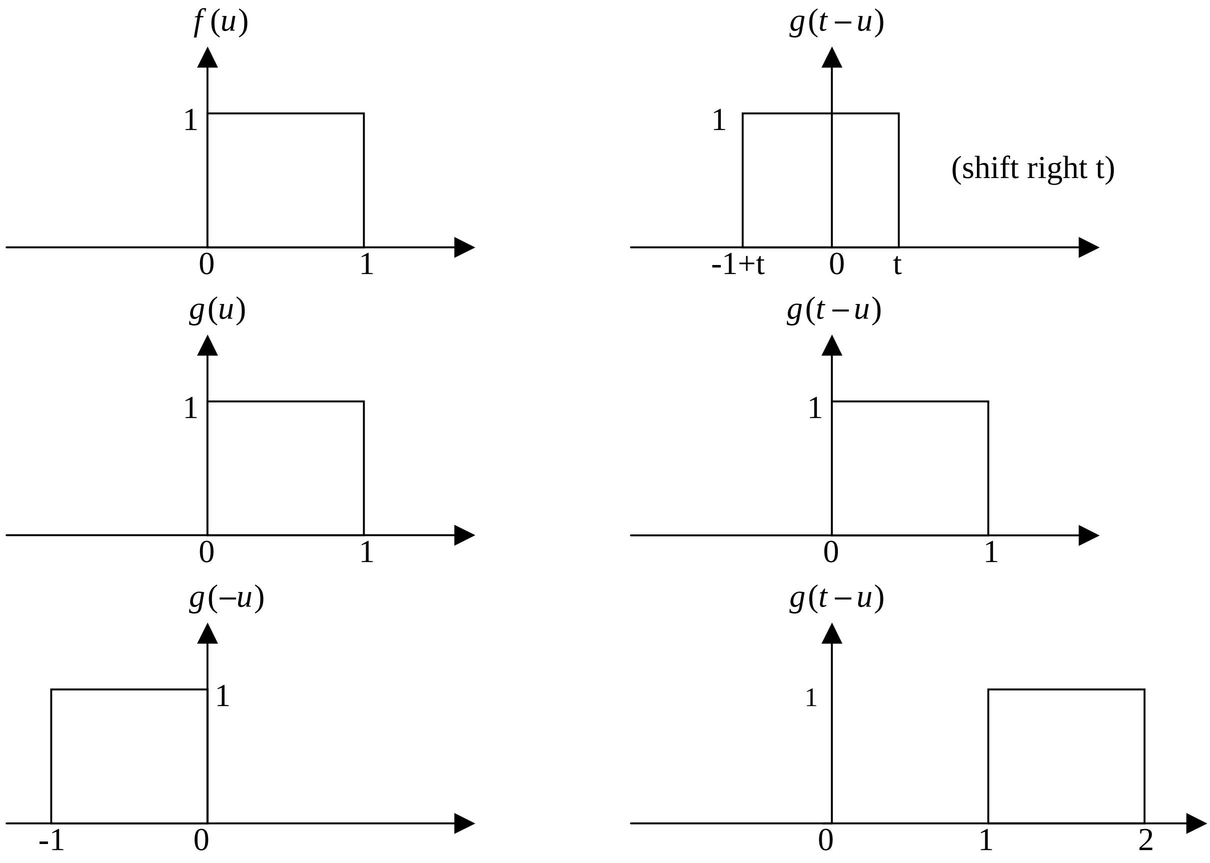
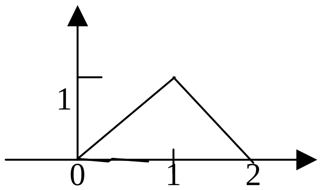


$$0<t<1 \quad \Rightarrow \quad \int_0^t 1\times1\,dt = t$$

$$1<t<2 \quad \Rightarrow \quad \int_{-1+t}^{1} 1\times1\,dt = 1-\left(-1-t\right) = 2-t$$



(1)

$$\int_0^t f(t)e^{-st}\,dt = \int_0^1 1e^{-st}\,dt = \left(\frac{e^{-st}}{-s}\right)\Big|_{t=0}^{t=1} = \frac{-e^{-s}}{s}+\frac{1}{s} = \frac{1-e^{-s}}{s}$$

(2)

$$\int_0^1 te^{-st}\,dt = \left(\frac{te^{-st}}{-s}\right)\Big|_{t=0}^{t=1} - \int_0^1 \frac{e^{-st}}{-s}\,dt = \left(\frac{e^{-s}}{-s}\right) + \int_0^1 \frac{1}{s}e^{-st}\,dt = \frac{e^{-s}}{-s} + \frac{e^{-st}}{(s)(-s)}\Big|_0^1 = \frac{-e^{-s}}{s} - \frac{e^{-s}}{s^2}+\frac{1}{s^2}$$

(3)

$$\int_1^2 (2-t)e^{-st}\,dt = \frac{(2-t)}{-s}e^{-st}\Big|_1^2 + \int_1^2 \frac{-1}{s}e^{-st}\,dt = \frac{1}{s}e^{-s} + \frac{-1e^{-st}}{s(-s)}\Big|_{t=1}^{t=2} = \frac{1}{s}e^{-s}+\frac{e^{-s}}{s^2}-\frac{e^{-2s}}{s^2}$$

$$f(t)*g(t) \quad \rightarrow \quad F(s)G(s) \quad \int_0^1 te^{-st}\,dt + \int_1^2(2-t)\,e^{-st}\,dt = \left(\frac{-e^{-s}}{s}-\frac{e^{-s}}{s^2}+\frac{1}{s^2}\right)+\left(\frac{1}{s}e^{-s}+\frac{e^{-2s}}{s^2}-\frac{e^{-s}}{s^2}\right)=\left(\frac{1-e^{-s}}{s}\right)^2$$