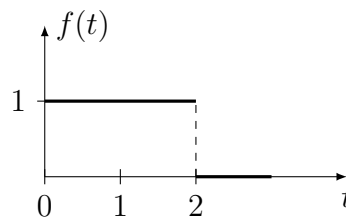


Find the Laplace transform of the function $f(t)$ whose graph is shown on the right. Recall that the Laplace transform is defined as

$$\mathcal{L}\{f(t)\} = \int_0^{\infty} e^{-st} f(t) dt.$$



Solution:

Since $f(t)$ is zero when $t > 2$, the evaluation of the Laplace transform reduces to an integration on the interval $0 \leq t \leq 2$. But $f(t) = 1$ on that interval, and therefore

$$\mathcal{L}\{f(t)\} = \int_0^2 e^{-st} dt = -\frac{1}{s} e^{-st} \Big|_{t=0}^{t=2} = -\frac{1}{s} e^{-2s} + \frac{1}{s}.$$

That's good enough, but optionally that may be expressed as

$$\mathcal{L}\{f(t)\} = \frac{1 - e^{-2s}}{s}.$$