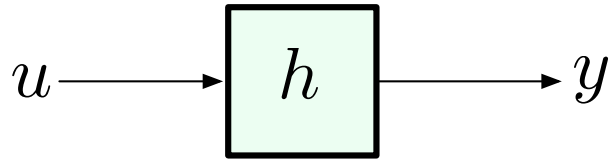
Steady-State Value



$$u(t) = 1(t) \qquad U(s) = \frac{1}{s} \qquad \Longrightarrow \qquad Y(s) = \frac{H(s)}{s}$$

— can we compute $y(\infty)$ from $Y(s)$?

Let's look at some examples:

- $Y(s) = \dfrac{1}{s+a}, \ a > 0 \quad$ (pole at $s = -a < 0$)
  $y(t) = e^{-at} \quad \Longrightarrow \quad y(\infty) = 0$
- $Y(s) = \dfrac{1}{s+a}, \ a < 0 \quad$ (pole at $s = -a > 0$)
  $y(t) = e^{-at} \quad \Longrightarrow \quad y(\infty) = \infty$
- $Y(s) = \dfrac{1}{s^2+\omega^2}, \ \omega \in \mathbb{R} \quad$ (poles at $s = \pm j\omega$, purely imaginary)
  $y(t) = \sin(\omega t) \quad \Longrightarrow \quad y(\infty)$ does not exist
- $Y(s) = \dfrac{c}{s} \qquad$ (pole at the origin, $s = 0$)
  $y(t) = c1(t) \quad \Longrightarrow \quad y(\infty) = c$