Laplace Transforms Revisited

Convolution: $\mathscr{L}\{f \star g\} = \mathscr{L}\{f\}\mathscr{L}\{g\}$
(useful because $Y(s) = H(s)U(s)$)

Example: $\dot{y} = -y + u \qquad y(0) = 0$

Compute the response for $u(t) = \cos t$

We already know

$$H(s) = \frac{1}{s+1} \qquad \text{(from earlier example)}$$
$$U(s) = \frac{s}{s^2+1} \qquad \text{(just proved)}$$

$$\Longrightarrow Y(s) = H(s)U(s) = \frac{s}{(s+1)(s^2+1)}$$
$$y(t) = \mathscr{L}^{-1}\{Y\}$$

— can't find $Y(s)$ in the tables. So how do we compute y?