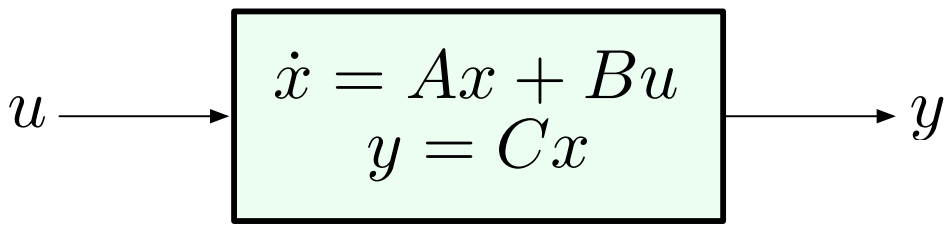
Laplace Transforms and the Transfer Function

$$Y(s) = H(s)U(s), \qquad \text{where } H(s) = \int_{-\infty}^{\infty} h(\tau)e^{-s\tau}\,\mathrm{d}\tau$$

Given $u(t)$, we can find $U(s)$ using tables of Laplace transforms or `MATLAB`. But how do we know $h(t)$ [or $H(s)$]?

- Suppose we have a state-space model:



In this case, we have an exact formula:

$$H(s) = C(Is - A)^{-1}B \qquad \text{(matrix inversion)}$$
$$h(t) = Ce^{At}B,\ t \geq 0^- \qquad \text{(matrix exponential)}$$

— will not encounter this until much later in the semester.