

## Example: Computing $G(s)$

Consider the state-space model in **Controller Canonical Form (CCF)\***:

$$\begin{pmatrix} \dot{x}_1 \\ \dot{x}_2 \end{pmatrix} = \underbrace{\begin{pmatrix} 0 & 1 \\ -6 & -5 \end{pmatrix}}_A \begin{pmatrix} x_1 \\ x_2 \end{pmatrix} + \underbrace{\begin{pmatrix} 0 \\ 1 \end{pmatrix}}_B u, \quad y = \underbrace{\begin{pmatrix} 1 & 1 \end{pmatrix}}_C \begin{pmatrix} x_1 \\ x_2 \end{pmatrix}$$

— this is a *single-input, single-output* (SISO) system, since  $u, y \in \mathbb{R}$ ; the state is two-dimensional.

Let's compute the transfer function:

$$G(s) = C(Is - A)^{-1}B \quad (D = 0 \text{ here})$$

$$Is - A = \begin{pmatrix} s & -1 \\ 6 & s + 5 \end{pmatrix}$$

\* We will explain this terminology later.