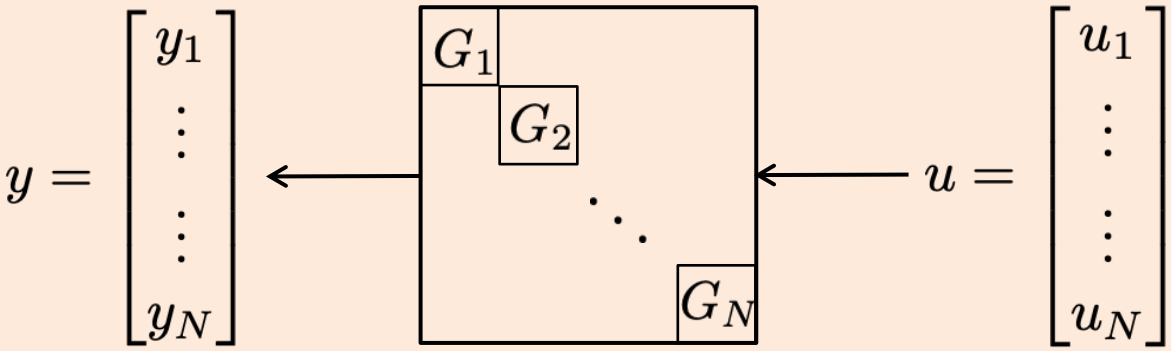
Self-Study Problems: True/False

1) If a dynamical system is dissipative with respect to supply rates s_1 and s_2, then it is dissipative with respect to rate $s_1 - s_2$.
2) For a dynamical system G, let $-G$ denote the same system with the sign of the output reversed. G is dissipative with respect to s if and only if $-G$ is dissipative with respect to $-s$.
3) Define the sum of two dynamical systems G_1 and G_2 as a dynamical system whose response to u is $y = G_1(u) + G_2(u)$. If G_1 is dissipative with supply rate s_1 and G_2 with supply rate s_2, then $G_1 + G_2$ is dissipative with supply rate $s_1 + s_2$.
4) If G_i is dissipative with supply rate $u_i^\top y_i \;\; i = 1,2$, then $G_1 + G_2$ is dissipative with supply rate $u^\top y$
5) If $\dot{x} = f(x,u), y = h(x,u)$ is dissipative, then so is the system $\tau\dot{x} = f(x,u), y = h(x,u)$ with the same supply rate for any $\tau > 0$.

Self-Study Problems: True/False

6) Consider N independent systems $G_i, i = 1, \ldots, N$, each with input output pair (u_i, y_i), and let u and y denote the concatenations of u_i and y_i as shown below:



If G_i is dissipative with supply rate $s_i(u_i, y_i)$, $i = 1, \ldots, N$, then for any set of nonnegative weights $p_i \geq 0, i = 1, \ldots, N$, the composite system is dissipative with supply rate:

$$s(u, y) = \sum_{i=1}^{N} p_i s_i(u_i, y_i)$$