

Solutions to LESSON 1 Self-Study Problems

- 1) False. Adding storage functions maintains nonnegativity, but subtracting does not.
- 2) False. $-G$ is dissipative with supply rate $s(u, -y)$ since the sign of output is reversed, but it is not necessarily the case that $s(u, -y) = -s(u, y)$.
- 3) False. Using the sum of the storage functions associated with each system, we would get $s_1(u, y_1) + s_2(u, y_2)$ which is not necessarily the same as $s_1(u, y) + s_2(u, y)$ where $y = y_1 + y_2$.
- 4) True. Using the sum of the storage functions associated with each system, we get $u^T y_1 + u^T y_2 = u^T (y_1 + y_2) = u^T y$.
- 5) True. Scale the storage function of the original system by τ to use as a storage function for the new system.
- 6) True. Use the weighted sum of the storage functions to verify.