Example 7.35. Consider the LTI system with system function

$$H(s) = \frac{s+1}{s+2} \quad \text{for } \text{Re}(s) > -2.$$

Determine all possible inverses of this system. Comment on the stability of each of these inverse systems.

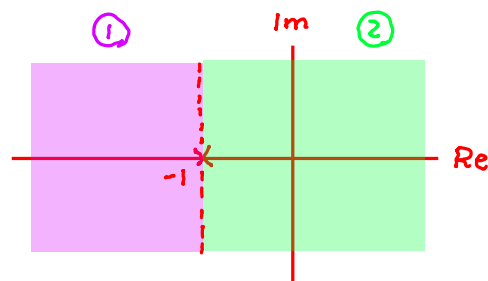*Solution.* The system function H_{inv} of the inverse system is given by

$$H_{\text{inv}}(s) = \frac{1}{H(s)} = \frac{s+2}{s+1}.$$

Two ROCs are possible for H_{inv}:
   i) $\text{Re}(s) < -1$ and
   ii) $\text{Re}(s) > -1$.
Each ROC is associated with a distinct inverse system. The first ROC is associated with an unstable system since this ROC does not include the imaginary axis. The second ROC is associated with a stable system, since this ROC includes the entire imaginary axis. ∎

region ① does not contain the imaginary axis and therefore corresponds to an unstable system

region ② contains the imaginary axis and therefore corresponds to a stable system