

Example 7.33. A LTI system is **causal** and has the system function

$$H(s) = \frac{1}{(s+2)(s^2+2s+2)}.$$

Determine whether this system is BIBO stable.

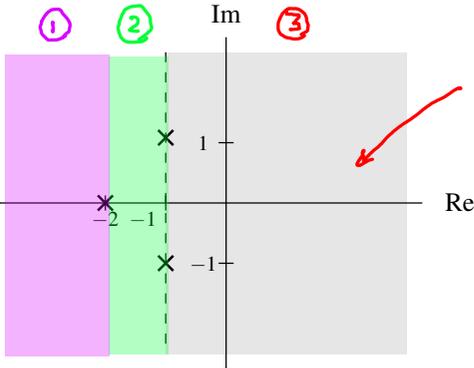
Solution. We begin by **factoring H** to obtain

$$H(s) = \frac{1}{(s+2)(s+1-j)(s+1+j)}.$$

(Using the quadratic formula, one can confirm that $s^2+2s+2=0$ has roots at $s=-1\pm j$.) Thus, H has **poles at -2 , $-1+j$, and $-1-j$** . The poles are plotted in **Figure 7.21**. Since the system is **causal** and all of the poles of H are in the **left half of the plane**, the system is **stable**.

↑ Since causal, ROC of H is RHP

Three possibilities exist for the ROC of H as shown.



This ROC is RHP. This ROC contains imaginary axis.

Figure 7.21: Poles of the system function.

■