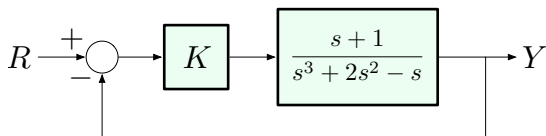


Example, continued



Problem: determine the range of values the **scalar gain** K can take, for which the closed-loop system is stable.

Let's write down the transfer function from R to Y :

$$\begin{aligned}\frac{Y}{R} &= \frac{\text{forward gain}}{1 + \text{loop gain}} \\ &= \frac{K \cdot \frac{s+1}{s^3+2s^2-s}}{1 + K \cdot \frac{s+1}{s^3+2s^2-s}} = \frac{K(s+1)}{s^3 + 2s^2 - s + K(s+1)} \\ &= \frac{Ks + K}{s^3 + 2s^2 + (K-1)s + K}\end{aligned}$$

Now we need to test stability of $p(s) = s^3 + 2s^2 + (K-1)s + K$.