Example, continued

Test stability of

$$p(s) = s^3 + 2s^2 + (K-1)s + K$$

using the Routh test.

Form the Routh array:

$$
\begin{array}{ccc}
s^3: & 1 & K-1 \\
s^2: & 2 & K \\
s^1: & \frac{K}{2}-1 & 0 \\
s^0: & K &
\end{array}
$$

For p to be stable, all entries in the 1st column must be positive:

$$K > 2 \quad \text{and} \quad K > 0 \quad \text{(already covered by } K > 1)$$

Note: The necessary condition requires $K > 1$, but now we actually know that we must have $K > 2$ for stability.