Example 4.9 检查稳定性

Q: $p(z) = z^4 - 1.2z^3 + 0.07z^2 + 0.3z - 0.08$ (1)

Routh stability Test

Solution $z = \frac{w+1}{w-1}$ 代入(1)

$$p(w) = \left(\frac{w+1}{w-1}\right)^4 - 1.2\left(\frac{w+1}{w-1}\right)^3 + 0.07\left(\frac{w+1}{w-1}\right)^2 + 0.3\frac{w+1}{w-1} - 0.08$$

$$p(w) = \frac{0.09w^4 + 1.32w^3 + 5.38w^2 + 7.32w + 1.89}{w^4 - 4w^3 + 6w^2 - 4w + 1}$$

?分子除以最高次数项系数 ✓

$$p'(w) = w^4 + 14.67w^3 + 59.78w^2 + 81.33w + 21$$

Solution Routh array method

w^4	1	59.78	21
w^3	14.67	81.33	
w^2	?	21	
w^1	?		
w^0	21		

跳一个

$$-\frac{1}{14.67}\begin{vmatrix} 1 & 59.78 \\ 14.67 & 81.33 \end{vmatrix}$$

$$= 54.23$$

$$-\frac{1}{54.23}\begin{vmatrix} 14.67 & 81.33 \\ 54.23 & 21 \end{vmatrix}$$

$$= 75.65$$