For a 2n-degree auxiliary polynomials $\exists$ n pairs of equal & opposite roots.

ex) $Q(s) = s^5 + 2s^4 + 24s^3 + 48s^2 - 25s - 50 = 0$

s^5	1	24	-25
s^4	2	48	-50 ← Auxiliary polinomial $Q_a(s)$
s^3	0	0	← all zeros — ②

by ② $\quad Q_a(s) = 2s^4 + 48s^2 - 50$

<u>1st Approach</u> $\quad$ use $\dfrac{d\,Q_a(s)}{ds} = 8s^3 + 96s$

$+\ s^5$	1	24	-25
$+\ s^4$	2	48	-50
$+\ s^3$	8	96	← replaced by coefficients of $\dfrac{d\,Q_a(s)}{ds}$
$+\ s^2$	24	-50	
$+\ s$	112.7	0	
$-\ s^0$	-50		

1 sign change → original C.E. has one root $\in$ RHP

&

By solving $\quad Q_a(s) = 0 \rightarrow \quad s^4 + 24s^2 - 25 = 0$

$(s^2+25)(s^2-1) = 0$

$s = \pm 5j \qquad s = \pm 1$

$s = +1 \in RHP$

2nd Approach   C.E.

use $\Rightarrow$ $Q(s) = Q_a(s) \cdot D_a(s) = 0$

original C.E.   Auxiliary polynomial.

$$D_a(s) = \frac{Q(s)}{Q_a(s)} \qquad Q_{a(s)} = s^4 + 24s - 25$$

$$\begin{array}{r l}
 & (s^1 + 2) \\
s^4 + 24s^2 - 25 \,\big) & s^5 + 2s^4 + 24s^3 + 48s^2 - 25s - 50 \\
 & s^5 + \quad + 24s^3 + \quad - 25s \\
\hline
 & 2s^4 + \quad + 48s^2 + \quad - 50 \\
 & 2s^4 \quad + 48s^2 \quad - 50 \\
\hline
 & 0
\end{array}$$

$$Q(s) = (s+2)\,(s^4 + 24s^2 - 25) = 0$$

$$= (s+2)(s^2+25)(s^2-1) = 0$$

$s = -2 \qquad s = \pm 5j \qquad s = \pm 1$