

Phase of H Along a Contour

For any $s \in \mathbb{C}$, the phase (or *argument*) of $H(s)$ is

$$\begin{aligned}\angle H(s) &= \angle \frac{(s - z_1) \dots (s - z_m)}{(s - p_1) \dots (s - p_n)} \\ &= \sum_{i=1}^m \angle(s - z_i) - \sum_{j=1}^n \angle(s - p_j) \\ &= \sum_{i=1}^m \psi_i - \sum_{j=1}^n \varphi_j\end{aligned}$$

We are interested in how $\angle H(s)$ changes as s traverses a closed, clockwise (\odot) oriented contour C in the complex plane.

We will look at several cases, depending on how the contour is located relative to poles and zeros of H .