Solution

The frequency response is
$$H(e^{j\omega}) = \frac{1 + 2e^{-j\omega}}{1 + 0.5e^{-j\omega}}$$

Evaluated at the four frequencies $\omega = 0,\ \pi/2,\ \pi,\ 5\pi/4$.

Note that $|1 + 2e^{-j\omega}|^2 = 5 + 4\cos\omega$ and $|1 + 0.5e^{-j\omega}|^2 = \tfrac{1}{4}(5 + 4\cos\omega)$, so the magnitude of H is **always 2**.

- $\omega = 0$: $\quad H = \dfrac{3}{1.5} = 2 \;=\; 2\angle 0^\circ$

- $\omega = \pi/2$: $\quad H = \dfrac{1-2j}{1-0.5j} = 2\angle(-63.43^\circ + 26.57^\circ) = 2\angle(-36.87^\circ)$

- $\omega = \pi$: $\quad H = \dfrac{-1}{0.5} = -2 \;=\; 2\angle 180^\circ$

- $\omega = 5\pi/4$: $\quad H = \dfrac{-0.4142 + 1.4142j}{0.6464 + 0.3536j} = 2\angle(106.32^\circ - 28.68^\circ) = 2\angle 77.64^\circ$

$$\text{HH} = \left[\; 2\angle 0^\circ,\quad 2\angle(-36.87^\circ),\quad 2\angle 180^\circ,\quad 2\angle 77.64^\circ \;\right]$$