

3.4.2014

①

Handout #11 active learning (pages 6-7)

$$y(n] = \frac{1}{3} x(n+1) + \frac{1}{3} x(n) + \frac{1}{3} x(n-1)$$

This corresponds to a convolution system,

$$h(n] = \left\{ \frac{1}{3}, \frac{1}{3}, \frac{1}{3} \right\}$$

(a) What's $H(\omega)$?

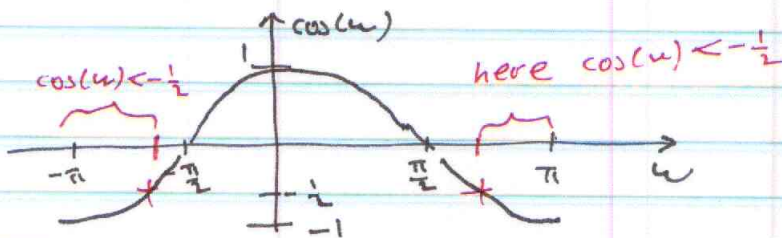
$$\begin{aligned} H(\omega) &= \frac{1}{3} \{ e^{+j\omega} + 1 + e^{-j\omega} \} \\ &= \frac{1}{3} + \frac{2}{3} \cos(\omega) \end{aligned}$$

(b) What's $|H(\omega)|$?

$$|H(\omega)| = \begin{cases} H(\omega) & H(\omega) \geq 0 \\ -H(\omega) & \text{else} \end{cases}$$

When is $H(\omega) < 0$? This requires

$$\frac{1}{3} + \frac{2}{3} \cos(\omega) < 0,$$

which implies $\cos(\omega) < -\frac{1}{2}$.Recall that $\cos(\omega) = -\frac{1}{2}$ for $\omega = \pm \frac{2}{3}\pi$.(c) $\angle H(\omega)$ is the phase.For $\omega \in [-\frac{2}{3}\pi, \frac{2}{3}\pi]$, $\angle H(\omega) = 0$. Else it's π .