$$y[n] = \frac{x[n] - x[n-1]}{2}$$

$$y[n] = \sum_{k=-\infty}^{\infty} x[k]\, h[n-k]$$

$$h[k] = \begin{cases} 1/2 & k=0 \\ -1/2 & k=1 \end{cases}$$

$$H(e^{j\omega}) = \sum_{-\infty}^{\infty} h[k]\, e^{-j\omega_0 k}$$

$$= \left(\frac{1}{2} - \frac{1}{2} e^{-j\omega_0}\right)$$

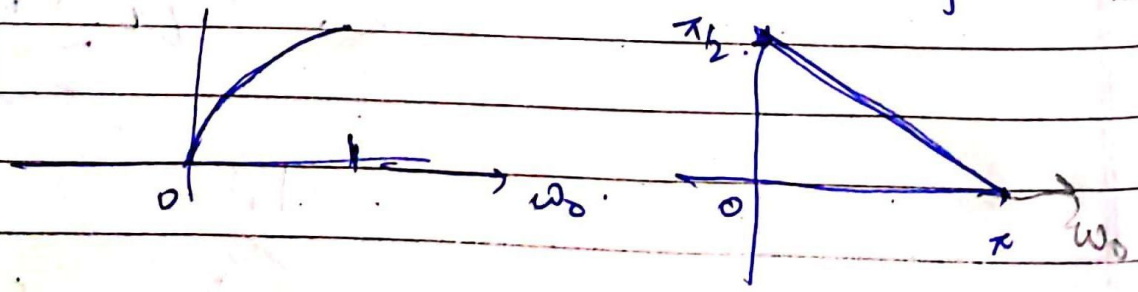
$$= \frac{1}{2}\left(1 - e^{-j\omega_0}\right)$$

$$= \frac{1}{2} e^{-j\omega_0/2}\left[e^{j\omega_0/2} - e^{-j\frac{\omega_0}{2}}\right]$$

$$= \frac{1}{2} e^{-j\omega_0/2} \cdot 2j \sin\left(\frac{\omega_0}{2}\right)$$

$$= e^{j\left(\pi/2 - \omega_0/2\right)} \sin\left(\frac{\omega_0}{2}\right)$$

Amplitude response. Phase response



Teacher's Signature .....