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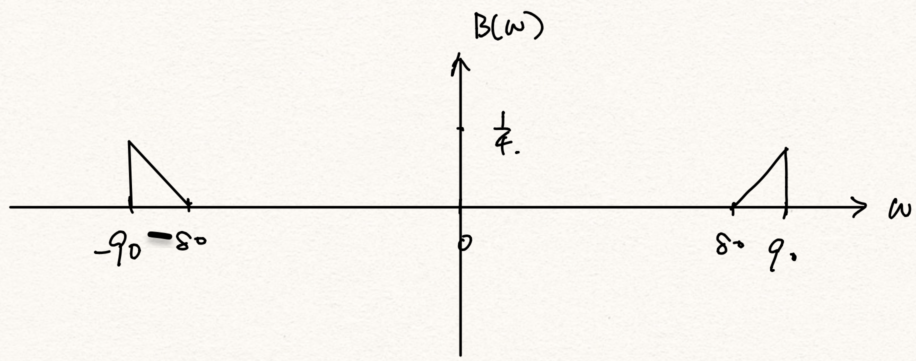
$$a(t) = x(t) \cdot c_1(t)$$

$$A(\omega) = \frac{1}{2\pi} \cdot X(\omega) * C_1(\omega)$$

$$= \frac{1}{2\pi} \cdot \left(\mathrm{tri}\left(\frac{\omega}{20}\right) * \left(\pi\delta(\omega-100) + \pi\,\delta(\omega+100)\right)\right.$$

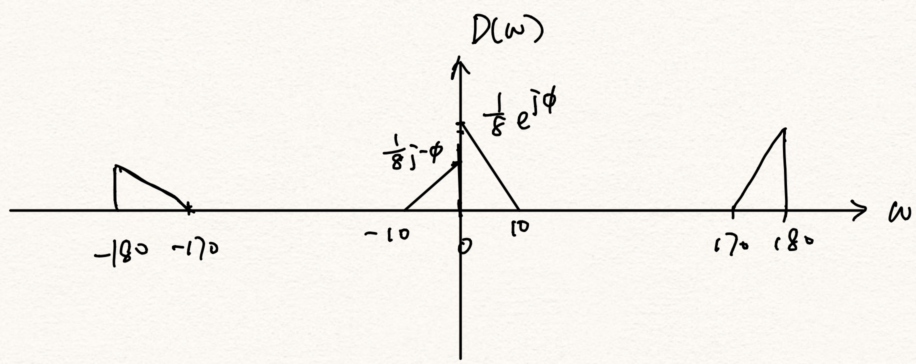
$$= \frac{1}{2} \left(\mathrm{tri}\left(\frac{\omega-100}{20}\right) + \mathrm{tri}\left(\frac{\omega+100}{20}\right) \right)$$

Thus. $B(\omega) = A(\omega) \cdot H_1(\omega) = \frac{1}{2}\left(\mathrm{tri}\left(\frac{\omega-100}{20}\right) + \mathrm{tri}\left(\frac{\omega+100}{20}\right)\right) \cdot \mathrm{rect}\left(\frac{\omega}{180}\right)$



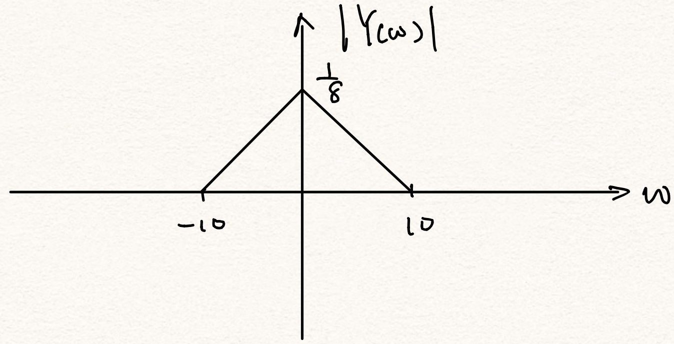
$$D(\omega) = B(\omega) * C_2(\omega)$$

$$= \frac{1}{2}\left[e^{j\phi} B(\omega-90) + e^{-j\phi} B(\omega+90) \right]$$

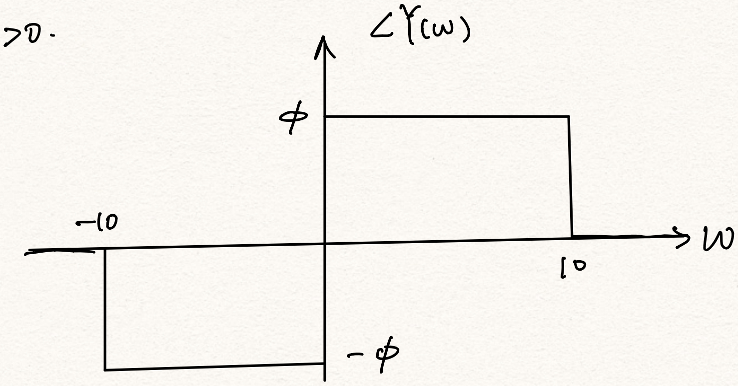


Since $Y(\omega) = D(\omega) \cdot H_2(\omega)$, where $H_2(\omega) = \mathrm{rect}\left(\frac{\omega}{60}\right)$,
we only need to consider $\omega \in [-30, 30]$

Therefore,



If $\phi > 0$.



If $\phi < 0$