

1 a)  $G(s) = \frac{5}{s+5}$

- convert  $G(s)$  into standard time constant form:

$$G(s) = \frac{\cancel{5}}{\cancel{5} \cdot (\frac{s}{5} + 1)} = \frac{1}{(1 + \frac{s}{5})}$$

- Replace "s" by "jw":

$$G(jw) = \frac{1}{(1 + \frac{jw}{5})}$$

↘ pole at frequency 5

- $|G(jw)|$ :

$$\begin{aligned} 20 \log |G(jw)| &= 20 \cdot \log \left| \frac{1}{1 + \frac{jw}{5}} \right| = 20 \cdot \log \frac{1}{|1 + \frac{jw}{5}|} \\ &= 20 \cdot \log |1| - 20 \log \left| 1 + \frac{jw}{5} \right| \\ &= 0 - 20 \log \left( \sqrt{1 + \left(\frac{w}{5}\right)^2} \right) \end{aligned}$$

Evaluate for possible values of "w":

$$w \gg 5 : |G(jw)| = -\infty$$

$$w = 5 : |G(jw)| = -20 \log \sqrt{2} = -3 \text{ dB}$$

$$w \ll 5 : |G(jw)| = 0$$

- $\angle G(jw)$ :

$$\angle G(jw) = \frac{\arg(1)}{\arg(1 + \frac{jw}{5})} = 0 - \underbrace{\arg\left(1 + \frac{jw}{5}\right)}_{\tan^{-1}\left(\frac{w}{5}\right)}$$

Evaluate for possible values of "w":

$$w \gg 5 : \angle G(jw) = -90^\circ$$

$$w = 5 : \angle G(jw) = -45^\circ$$

$$w \ll 5 : \angle G(jw) = 0^\circ$$

1a) continuous

