1 b) $G(s) = \frac{100}{s(s+10)}$

- Rewrite the transfer function as a product of basic factors:

$G(s) = 100 \cdot \frac{1}{s} \cdot \frac{1}{(s+10)}$

- Convert into the T.F. as a product of Bessis factors:

$G(s) = 100 \cdot \frac{1}{s} \cdot \frac{1}{10.(\frac{s}{10}+1)}$

$= 10 \cdot \frac{1}{s} \cdot \frac{1}{(\frac{s}{10}+1)}$

- Replace "s" by "jw":

$G(jw) = \underset{\text{Gain K}}{10} \cdot \underset{\text{Pole at origin}}{\frac{1}{jw}} \cdot \frac{1}{(1+\frac{jw}{10})}$ → pole at frequency 10 rad/sec

- $|G(jw)|$:

$20 \text{Log}|G(jw)| = 20 \text{Log}(10) - 20 \text{Log}(|w|) - 20 \log(|1+\frac{jw}{10}|)$

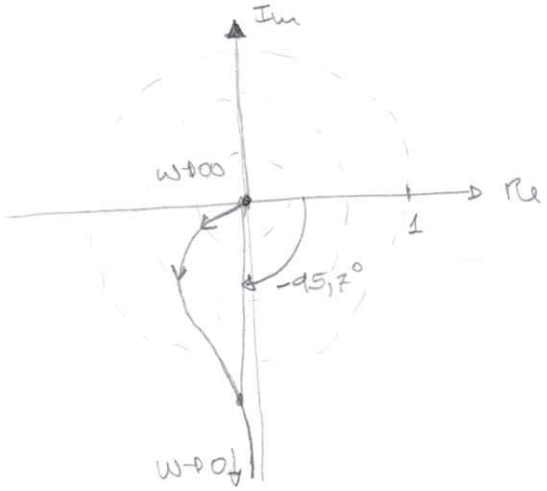
$= 20\,dB - 20 \text{Log}(w) - \underbrace{20 \log(\sqrt{1^2+(\frac{w}{10})^2})}_{A}$

- Draw the Polar Plot

$G(jw) = 10 \cdot \frac{1}{jw} \cdot \frac{1}{(1+\frac{jw}{10})}$

$= 10 \cdot \frac{1}{|w|} \cdot \frac{1}{\sqrt{1^2+(\frac{w}{10})^2}} \quad \underline{0° - 90° - tg^{-1}(\frac{w}{10})}$

w	$G(jw)$ (×10)	$\underline{G(jw)}$
∅	∞	$-90°$ error
0,1	10 (×10)	$-90,6°$
1	1 (×10)	$-95,7°$
2	0,49 (×10)	$-101,3°$
4	0,232 (×10)	$-111,8°$
∞	∅	$-180°$



1 b) continuacao

Evaluate for possible values of "w": $|G(jw)|$

$w >> 10$: $A = +\infty$

$w = 10$: $A = 20 \log \sqrt{2} = 3\,dB$

$w << 10$: $A = \phi$

$20 \log |G(jw)| \Rightarrow$

Note (K_B):
Gain: $20 \log |K_B|$
Fase: $0°$ if $K_B > 0$
$-\infty$ if $K_B < 0$

- $|G(jw)|$:

$$|G(jw)| = \arg(10) - \arg(jw) - \arg\left(1 + \frac{jw}{10}\right)$$

$$= \phi - 90° - \arg\left(1 + \frac{jw}{10}\right)$$

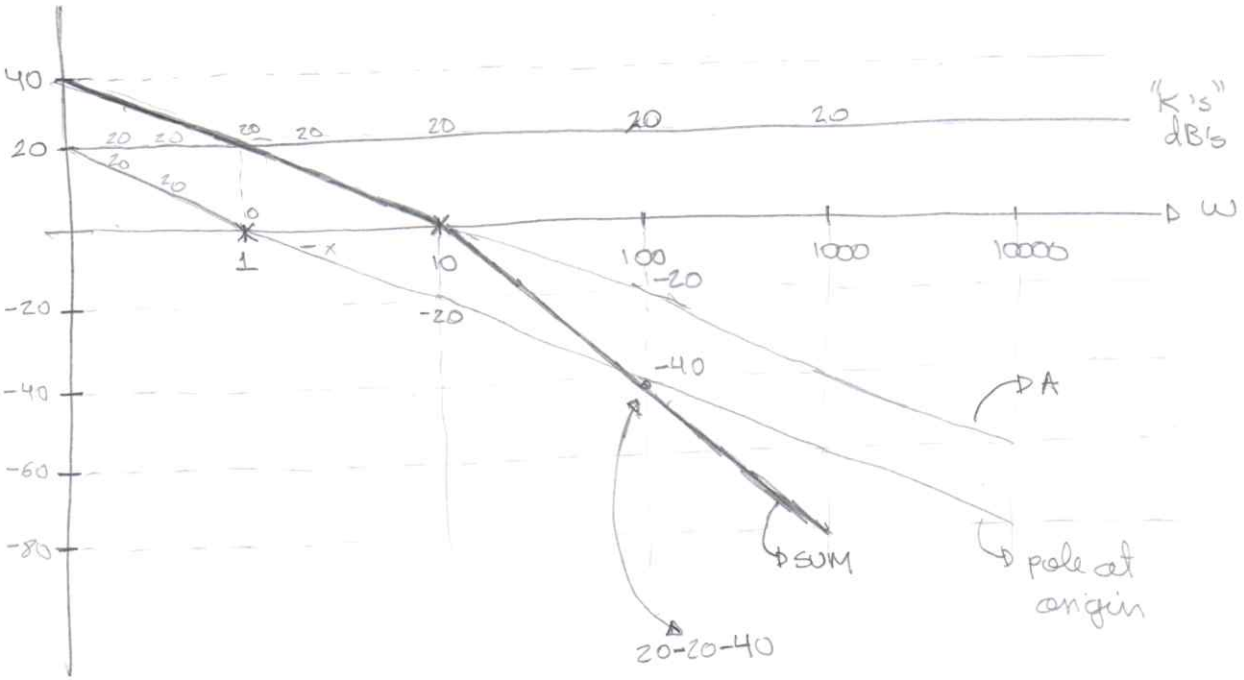
Evaluate for possible values of "w": B

$w >> 10$: $B = 90°$

$w = 10$: $B = 45°$

$w << 10$: $B = \phi$

$20 \log |G(jw)|$



1 b) continuação

$|G(j\omega)|$