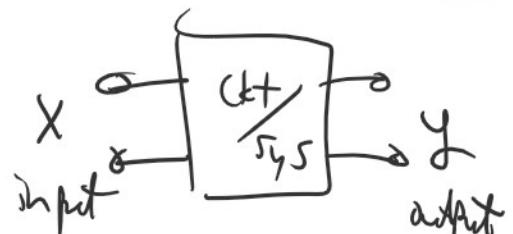


Suppose that we have

$$H(s) = \frac{Y(s)}{X(s)} = \frac{2000(s/500)}{s+200}$$



→ Get TF in proper Bode form  $\Rightarrow$  one or more of the 7

Covered terms:  $\pm K, (1+s/w_k), \dots$

$$H(s) = \frac{200(s/500)}{s+200} = \frac{10 \cdot \frac{s}{500}}{1 + \frac{s}{200}}$$

Gain term:  $10$  (highlighted in red)

Zero @ DC:  $s=0, \frac{s}{500}=0$

W/  $500$  rps OdB crossing:  $\omega_c = 200$  rps

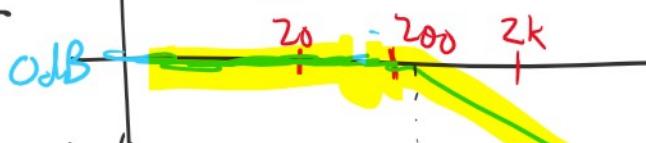
Pole term,  $w_p = 200$  rps



$$K_{dB} = 20 \log_{10}(10) \approx 20dB$$

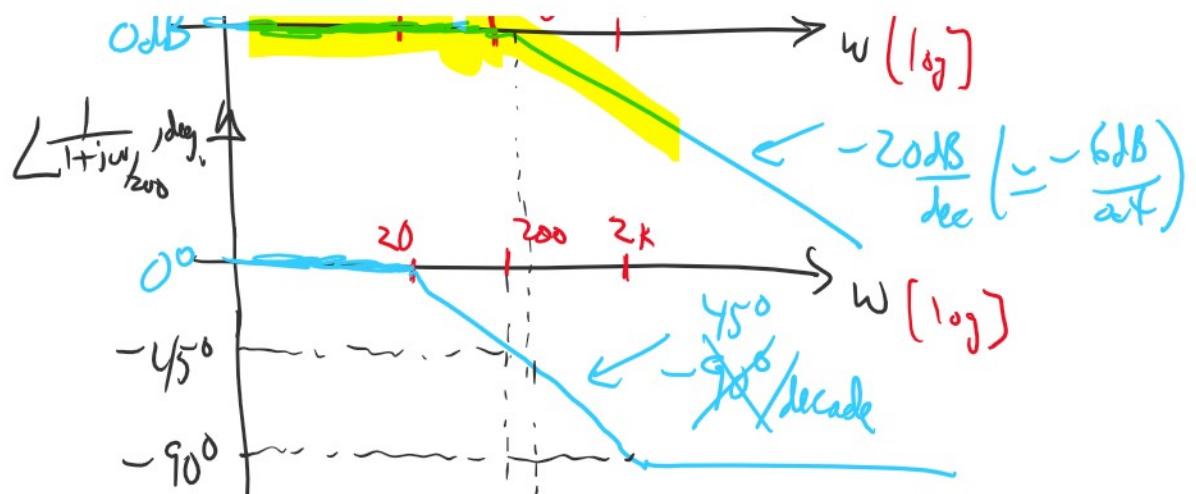


$$\frac{1}{1+j\omega/\omega_p}, dB$$

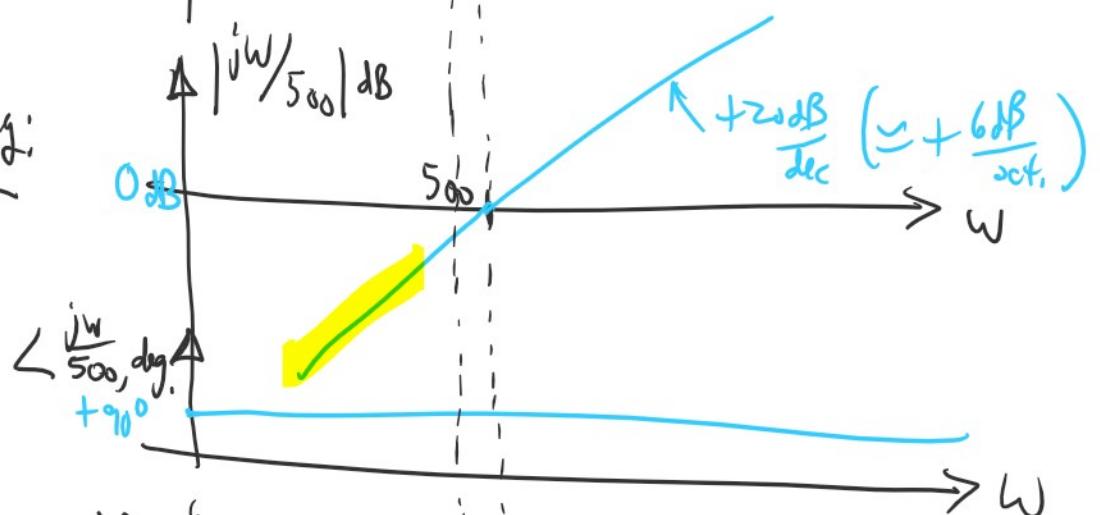


$$\frac{1}{(1+s/w_p)^2}$$

$$w (\log)$$

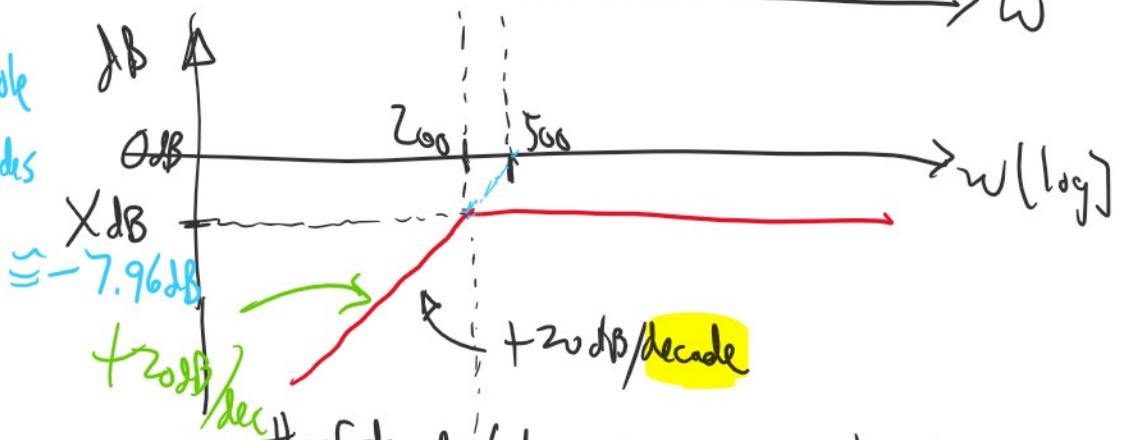


\*Zero @ DC  
w/ 500 orps (dB Xing):



Let's combine the pole & zero @ DC magnitudes first.

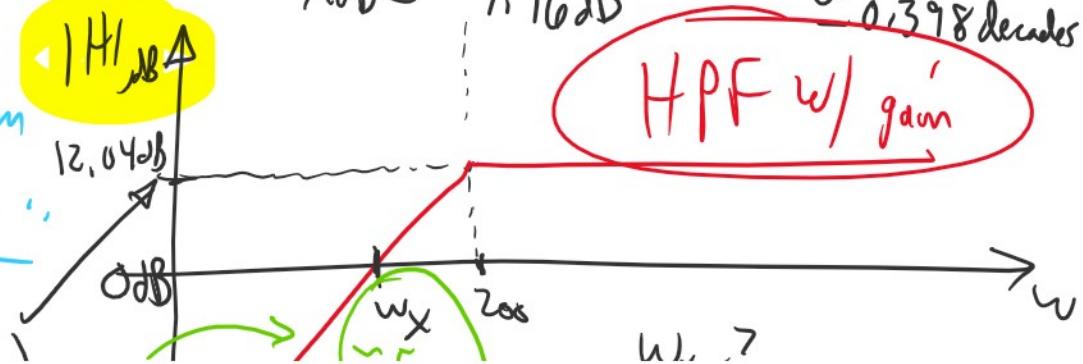
$$X_{dB} = ?$$



$$X_{dB} + \frac{20 \text{ dB}}{\text{dec}} (0.398 \text{ dec}) = 0 \text{ dB}$$

$\Rightarrow X_{dB} \approx -7.96 \text{ dB}$       # of decades between 200 & 500  $\Rightarrow \log_{10} \left( \frac{500}{200} \right) \approx 0.398 \text{ decades}$

Now add  $K_{dB}$  from  
to get overall  $|H|_{dB}$  ..



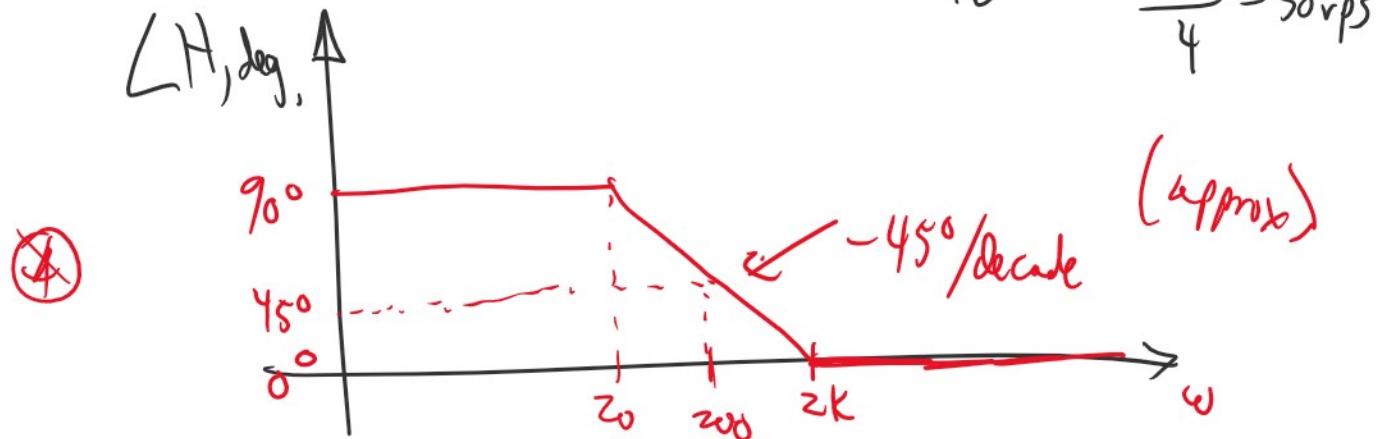
$$\begin{aligned}
 & 20dB + \left( \frac{-7.96dB}{10dB} \right) = 12.04dB \\
 & 0dB + 20dB/\text{dec} \quad \text{at } \omega = 200 \\
 & \approx 12.04dB
 \end{aligned}$$

0dB       $\omega = 200$   
 $w_x = ?$   
 $0dB + 20dB/\text{dec} \left( \log_{10} \left( \frac{200}{w_x} \right) \right) = 12.04dB$

$$\text{\# of decades} = \frac{12.04dB}{20dB/\text{dec}} \approx 0.602 \text{ decades}$$

$$\log_{10} \left( \frac{200}{w_x} \right) \text{ set} \approx 0.602 \text{ decades} \Rightarrow w_x = \frac{200}{10^{0.602}} = \frac{200}{4} = 50 \text{ rps}$$

# of decades  
 between  $w_x, 200$   
 $12.04dB = 20 \log_{10} (\text{H?})$   
 $H_7V/V = (12.04/20)$



$$V_{in}(t) = A \cos(\omega_0 t), \quad V_{out}(t) = A |H(j\omega_0)| \cos(\omega_0 t + \angle H(j\omega_0))$$

|| undB fixed ||