The transfer function for a circuit, $H_1(\omega)$, is given below. Plot the straight-line approximation to the magnitude and phase Bode plot. Be sure to label the axes and identify the unit of the variable being plotted.

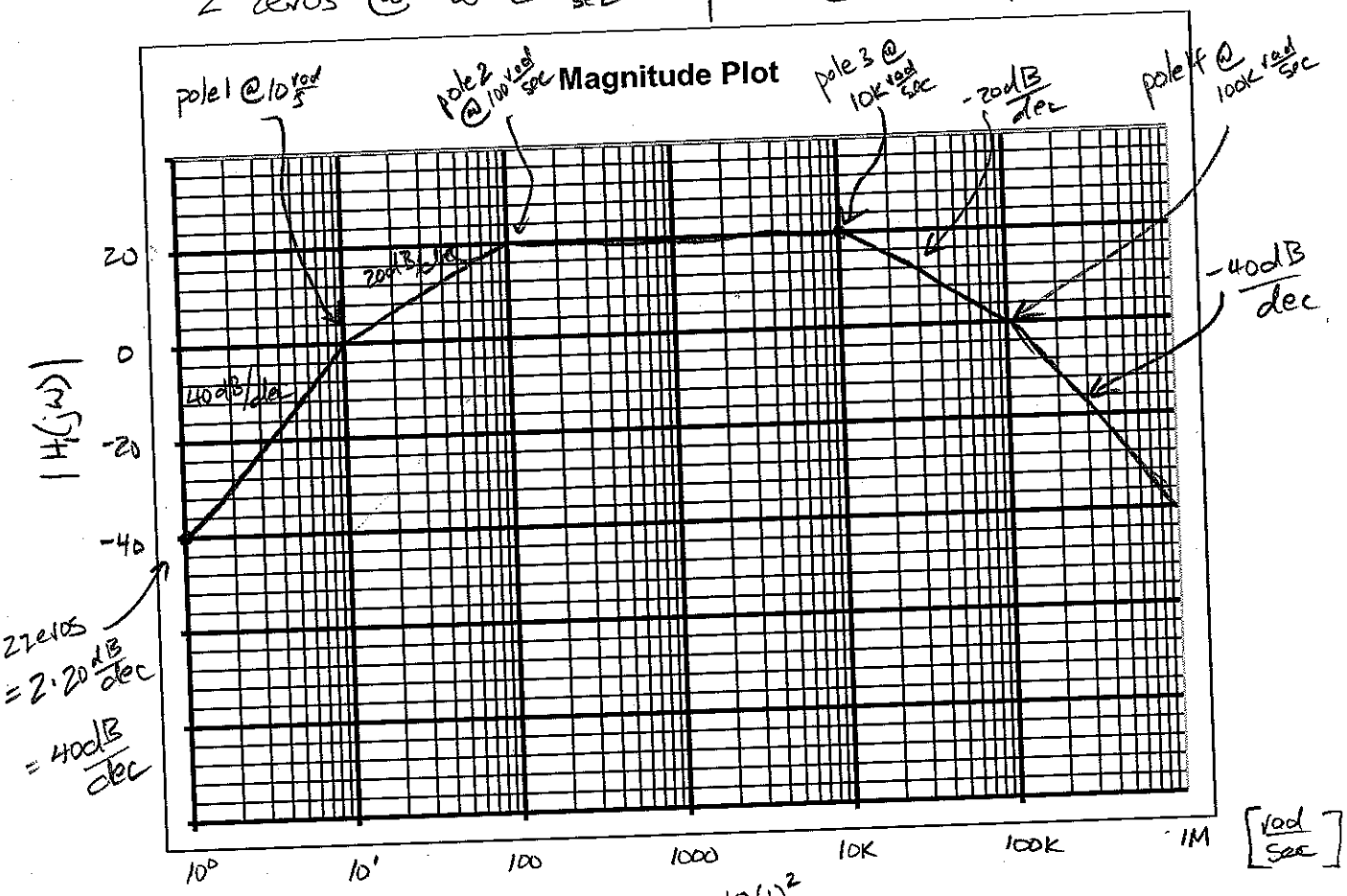
$$H_1(\omega) = \frac{-10}{\left(1 - j\frac{10}{\omega}\right)\left(1 - j\frac{100}{\omega}\right)\left(1 + j\frac{\omega}{10{,}000}\right)\left(1 + j\frac{\omega}{100{,}000}\right)}$$

Rewrite $H_1(\omega)$:

$$\frac{\left(\frac{j\omega}{10}\right)\left(\frac{j\omega}{100}\right)}{\left(j\frac{\omega}{10}\right)\left(j\frac{\omega}{100}\right)} \cdot \frac{-10}{\left(1 - j\frac{10}{\omega}\right)\left(1 - j\frac{100}{\omega}\right)\left(1 + j\frac{\omega}{10K}\right)\left(1 + j\frac{\omega}{100K}\right)}$$

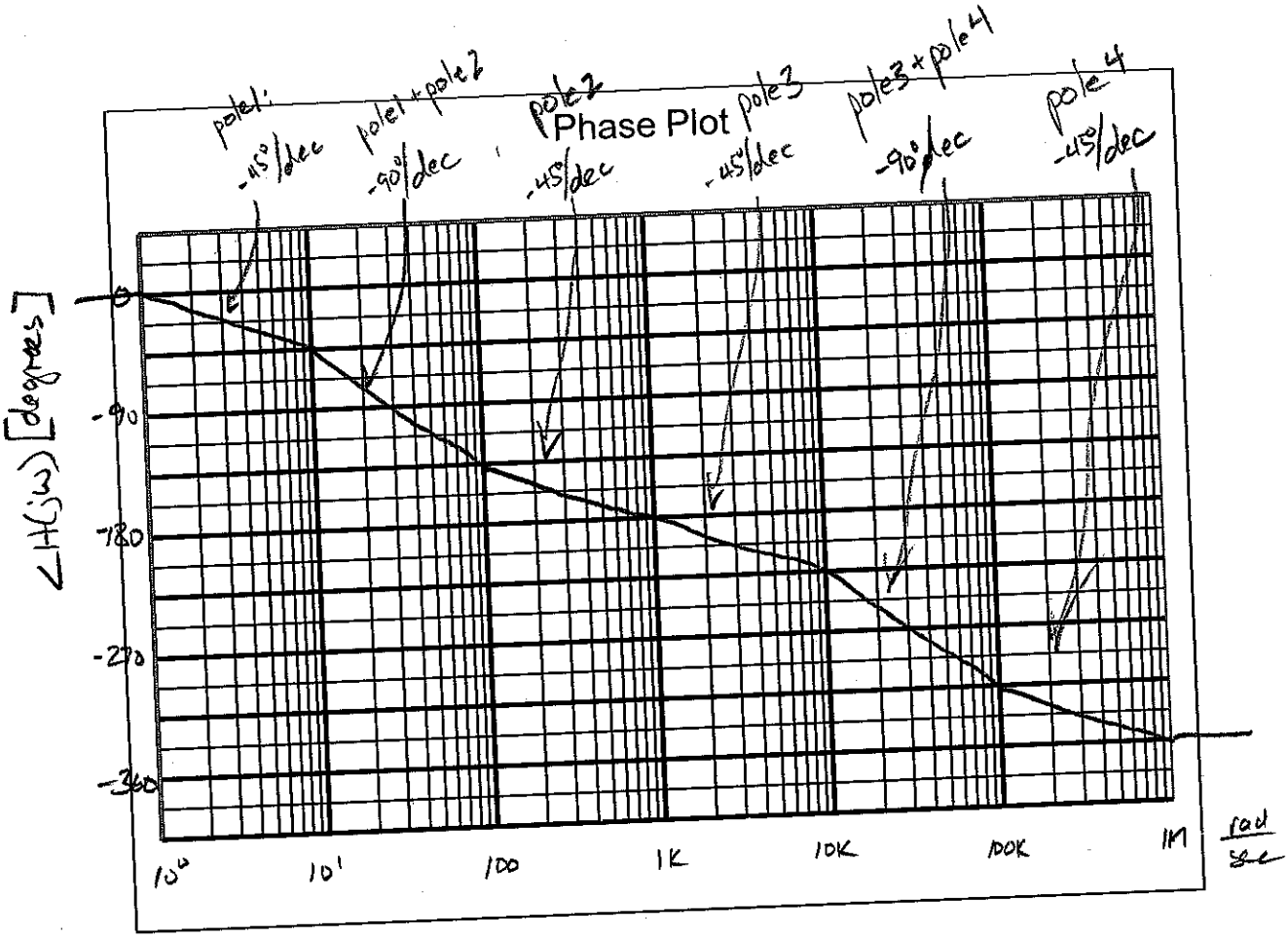
$$= \frac{-10\left(j\frac{\omega}{10}\right)\left(j\frac{\omega}{100}\right)}{\left(1 + j\frac{\omega}{10}\right)\left(1 + j\frac{\omega}{100}\right)\left(1 + j\frac{\omega}{10K}\right)\left(1 + j\frac{\omega}{100K}\right)}$$

2 zeros @ $\omega = 0$ $\frac{rad}{sec}$ 4 poles @ $\omega = 10, 100, 10K, 100K$ $\frac{rad}{sec}$



$$H\left(1\frac{rad}{sec}\right) \sim \frac{-(j)^2 \frac{10(1)^2}{10 \cdot 100}}{(1+j0)(1+j0)(1+j0)(1+j0)} \sim \frac{1}{100} = 10^{-2}$$

$$\left|H\left(1\frac{rad}{sec}\right)\right| \rightarrow -40dB$$



$$\angle H\left(1\tfrac{rad}{sec}\right) = 0^\circ$$