THE OHIO STATE UNIVERSITY

COLLEGE OF ENGINEERING

Bode Plot

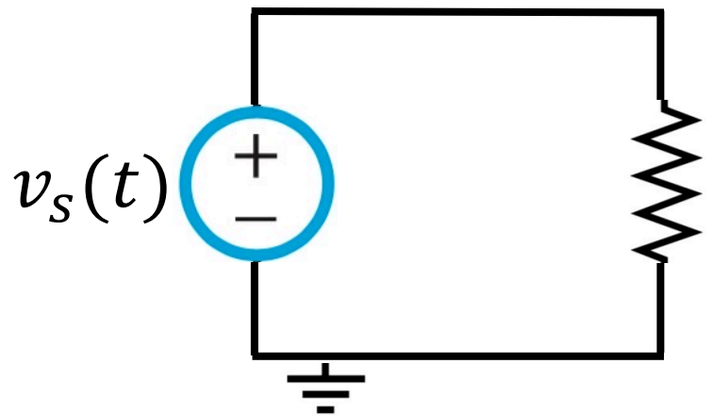
This Lecture…

- Learning Objectives:
  - Generate magnitude frequency plots for high and low pass-filters.

Sketch a Bode Plot

Simples Transfer Function (constant):

- $H(s) = K$



Sketch a Bode Plot

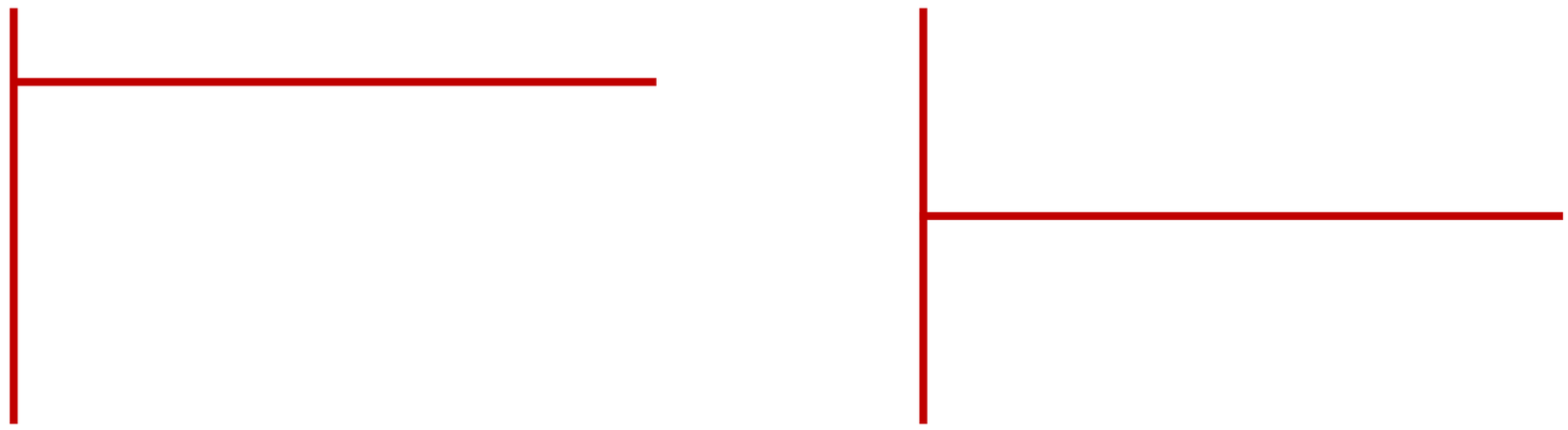
Pole @ the origin:

- $H(s) = \frac{1}{j\omega}$

Sketch a Bode Plot

Pole @ the origin:

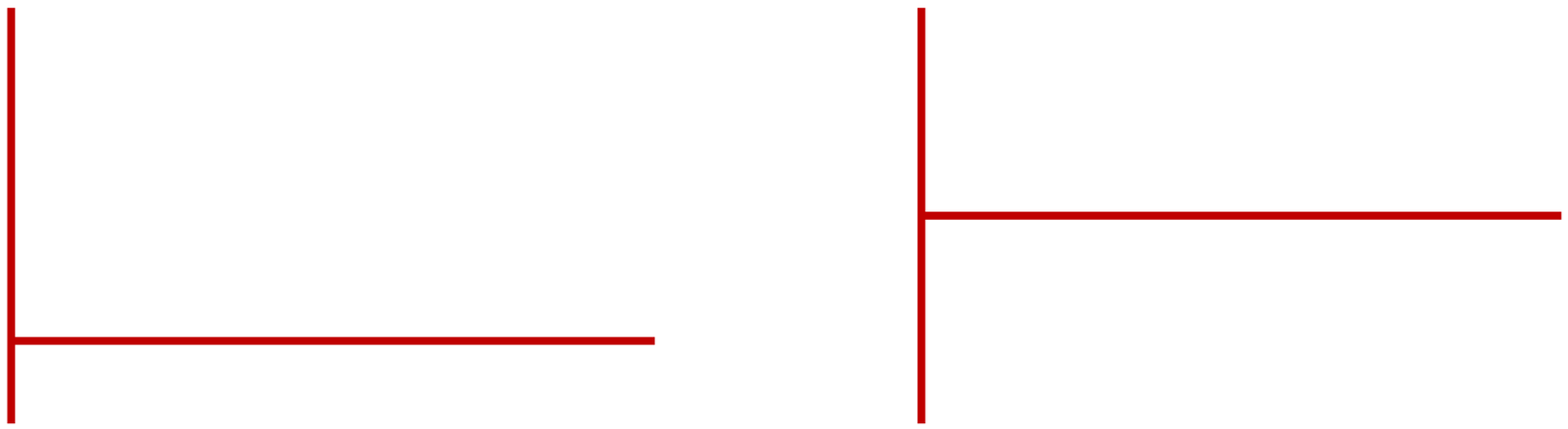
$$H(s) = \frac{K}{j\omega} \qquad \mathrm{G}(s) = \frac{K}{(j\omega)^2}$$



Sketch a Bode Plot

Zero @ the origin:

- $H(s) = j\omega$



Sketch a Bode Plot

Real Pole:

- $H(s) = \frac{1}{1 + \frac{j\omega}{\omega_0}}$

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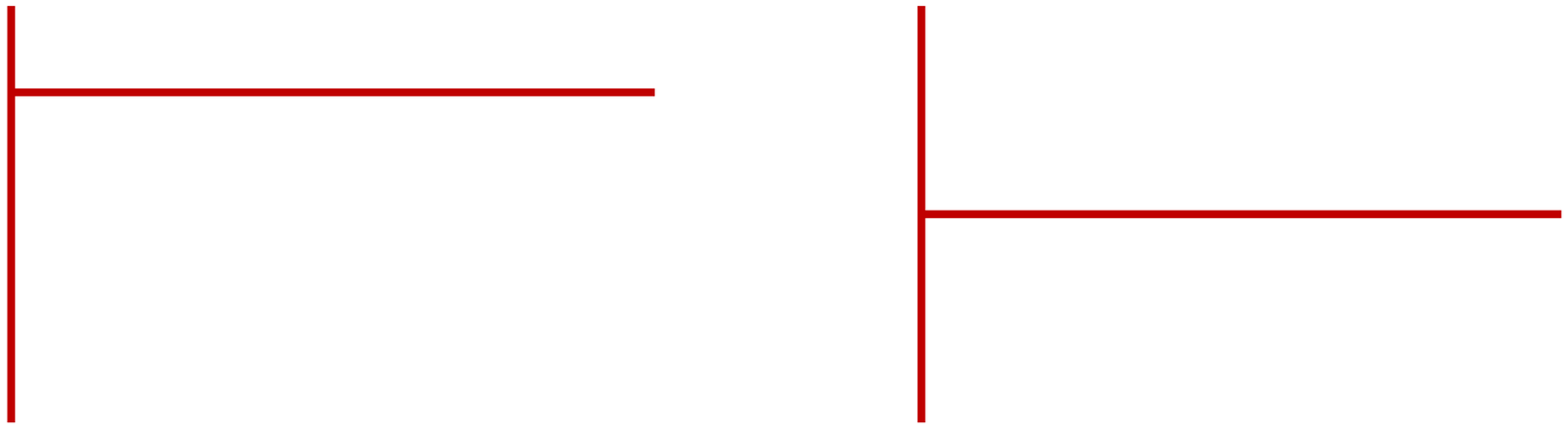
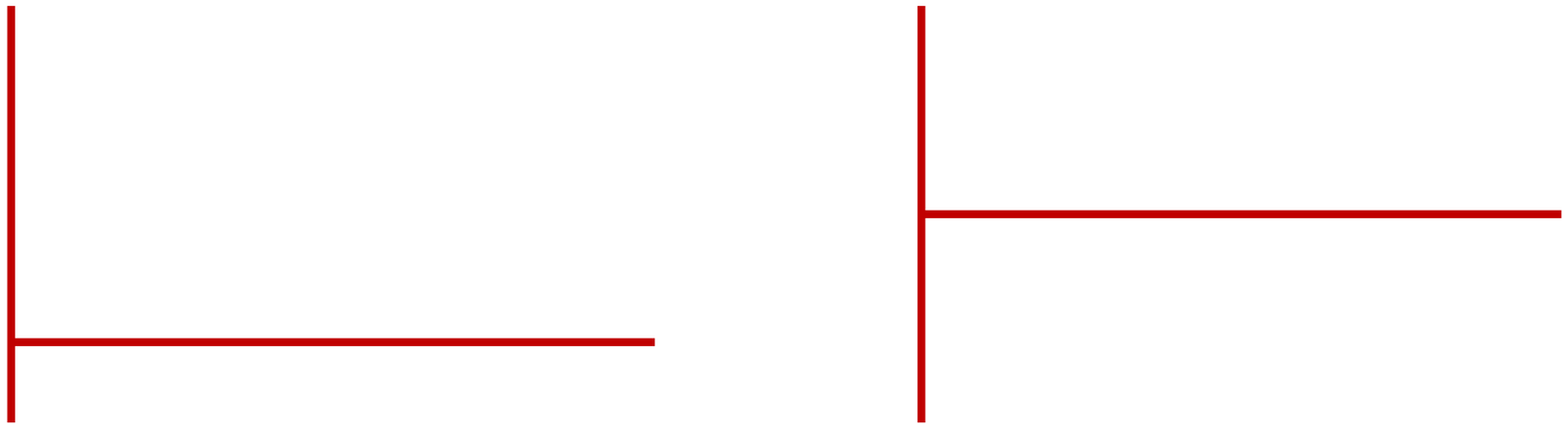


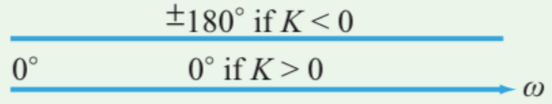
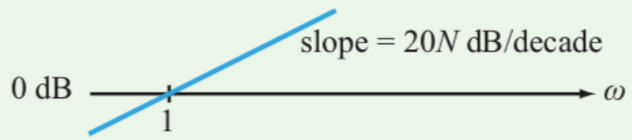
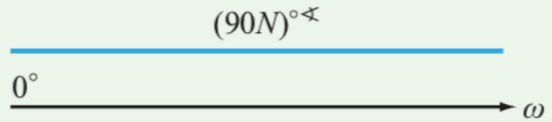
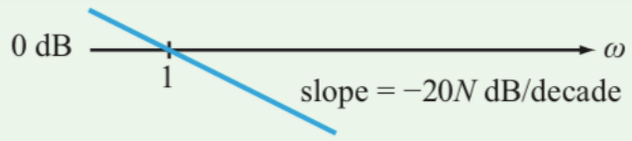
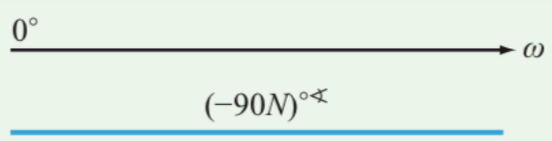
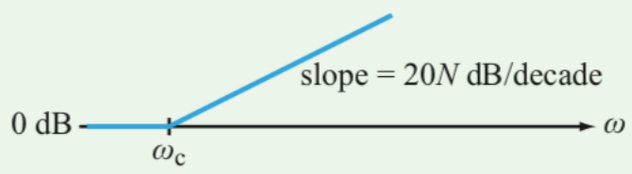
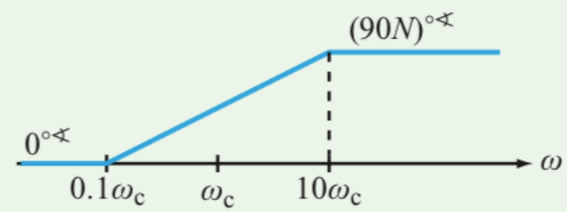
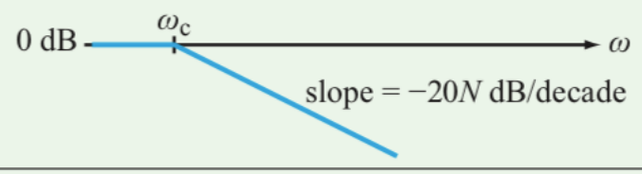
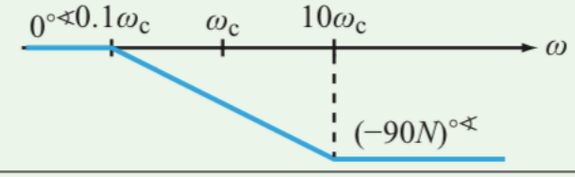
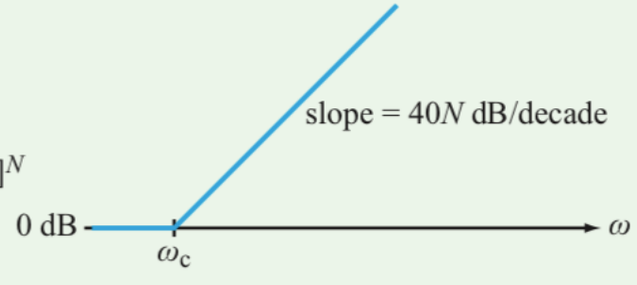
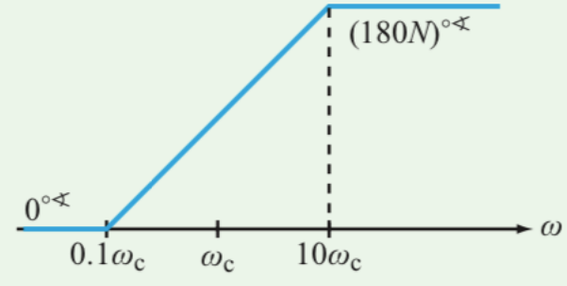
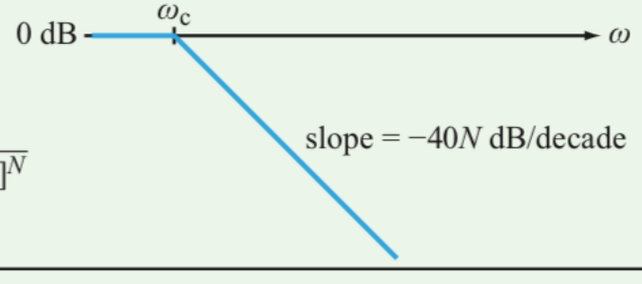
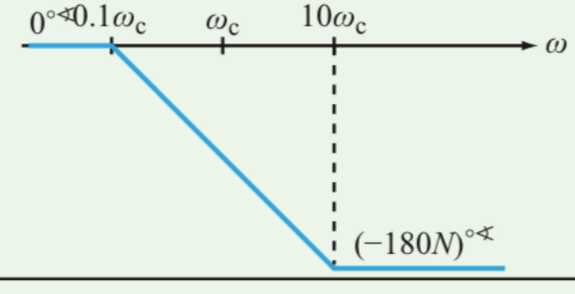
Sketch a Bode Plot

Real Zero:

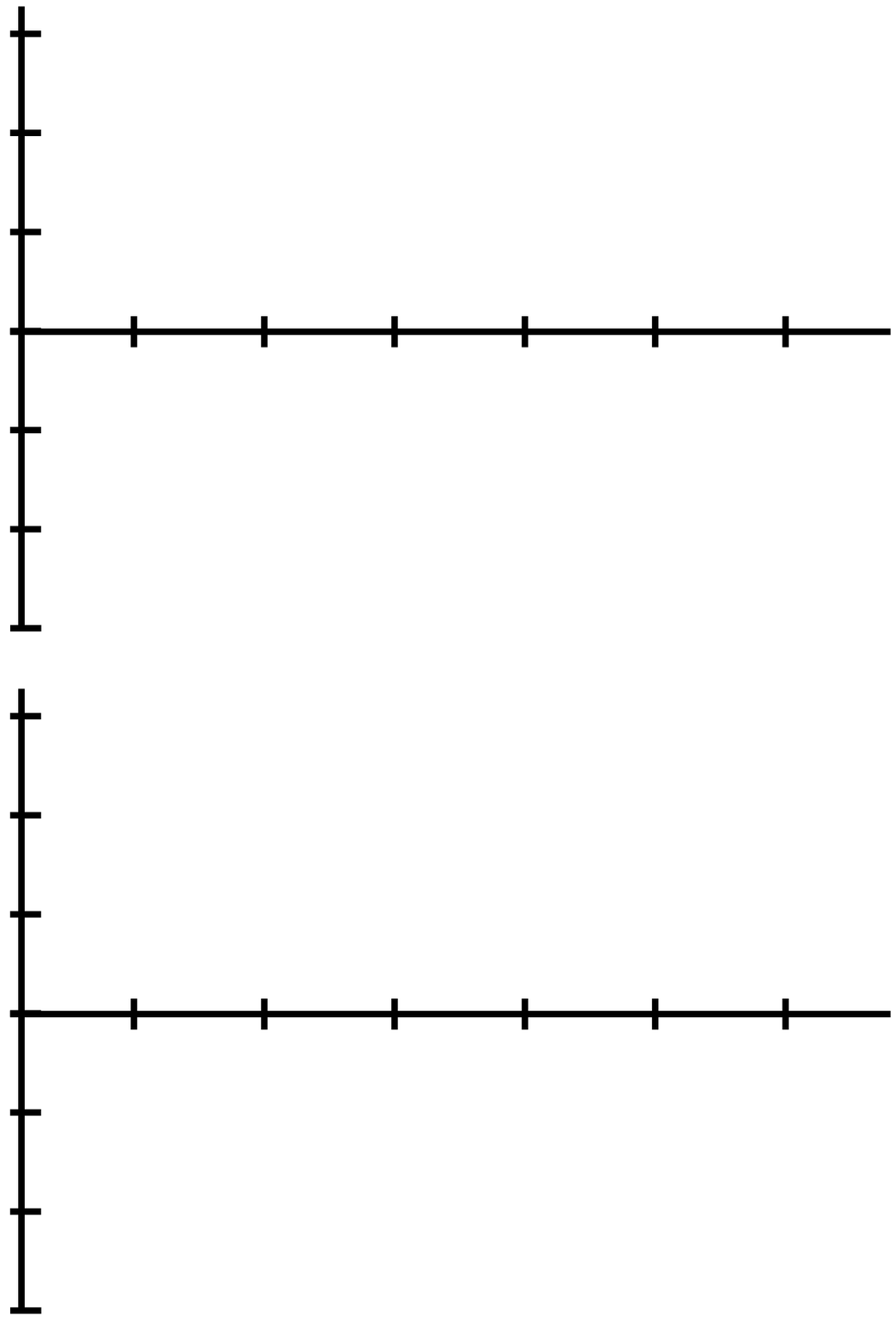
- $H(s) = 1 + \frac{j\omega}{\omega_0}$



Sketch a Bode Plot

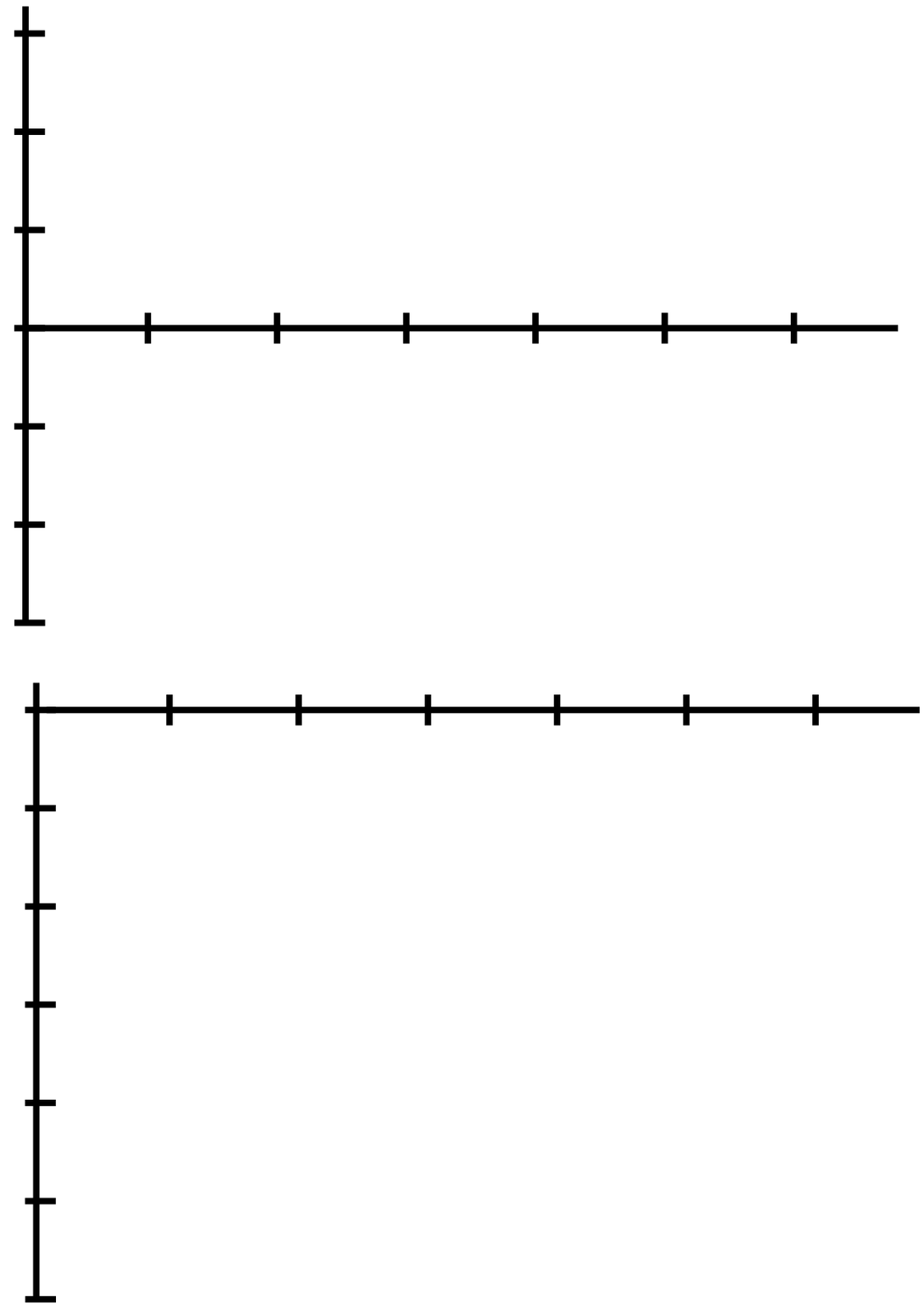
Factor	Bode Magnitude	Bode Phase
Constant K		
Zero @ Origin $(j\omega)^N$		
Pole @ Origin $(j\omega)^{-N}$		
Simple Zero $(1 + j\omega/\omega_c)^N$		
Simple Pole $\left(\frac{1}{1 + j\omega/\omega_c}\right)^N$		
Quadratic Zero $[1 + j2\xi\omega/\omega_c + (j\omega/\omega_c)^2]^N$		
Quadratic Pole $\frac{1}{[1 + j2\xi\omega/\omega_c + (j\omega/\omega_c)^2]^N}$		

Example 1



Example 2

$$\boldsymbol{H}(s) = \frac{1 + 0.01j\omega}{1 + 0.1j\omega}$$



Example 3