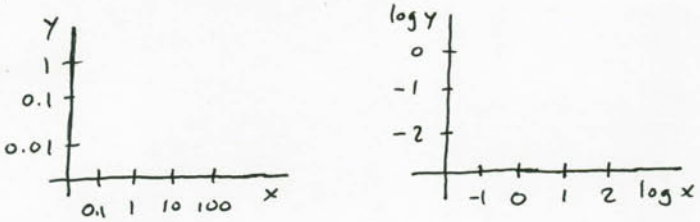
Rules to Making Bode Plots

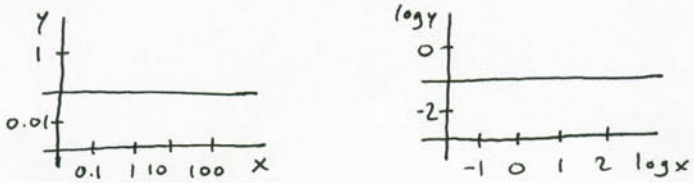
1. log-log means that on a regular coordinate grid (ordinary graph paper), each gradation is an order of magnitude.

   Eg. These two are equivalent:



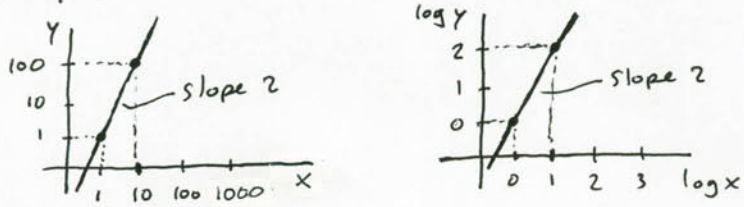
2. Constants have 0 slope.

   Eg. $y = 0.1$ $\qquad$ $\log y = -1$



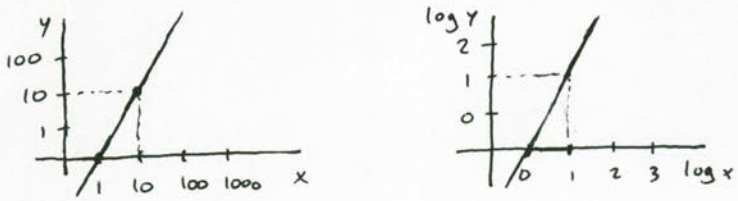
3. Powers become slopes.

   Eg. $y = x^2$ $\qquad$ $(\log y) = 2(\log x)$



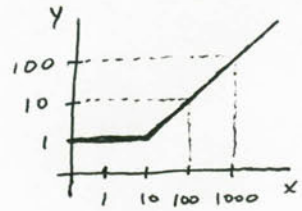
4. Slopes become shifts.

   Eg. $y = \frac{x^2}{10}$ $\qquad$ $(\log y) = 2(\log x) - 1$

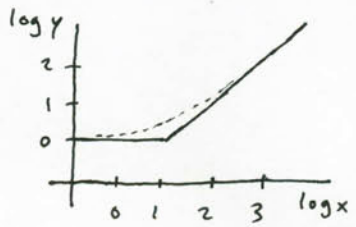


5. Corners are piecewise. $y = b + ax = \begin{cases} b & \text{when } ax < b \\ ax & \text{when } ax > b \end{cases}$

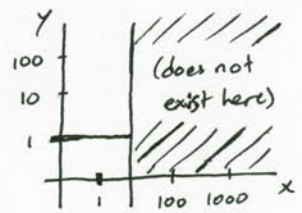
Eg. $y = 1 + \frac{x}{10}$



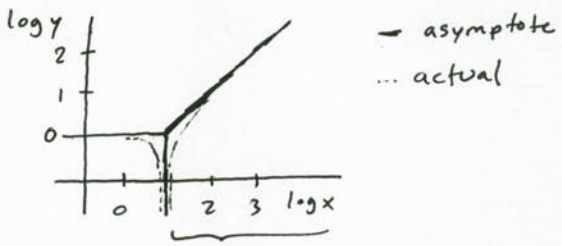
$\log|y| = \log\left|1 + \frac{x}{10}\right|$



Eg. $y = 1 - \frac{x}{10}$

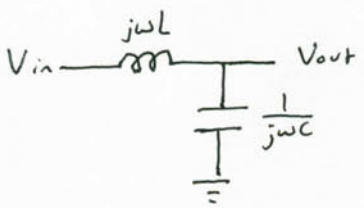


$\log|y| = \log\left|1 - \frac{x}{10}\right|$



exists here because absolute value

Example of theoretical Bode plot.



$$\frac{V_{out}}{V_{in}} = \frac{\frac{1}{j\omega C}}{j\omega L + \frac{1}{j\omega C}} = \frac{1}{1 - \omega^2 LC}$$

$$\log\left|\frac{V_{out}}{V_{in}}\right| = -\log\left|1 - \left(\frac{\omega}{1/\sqrt{LC}}\right)^2\right|$$