

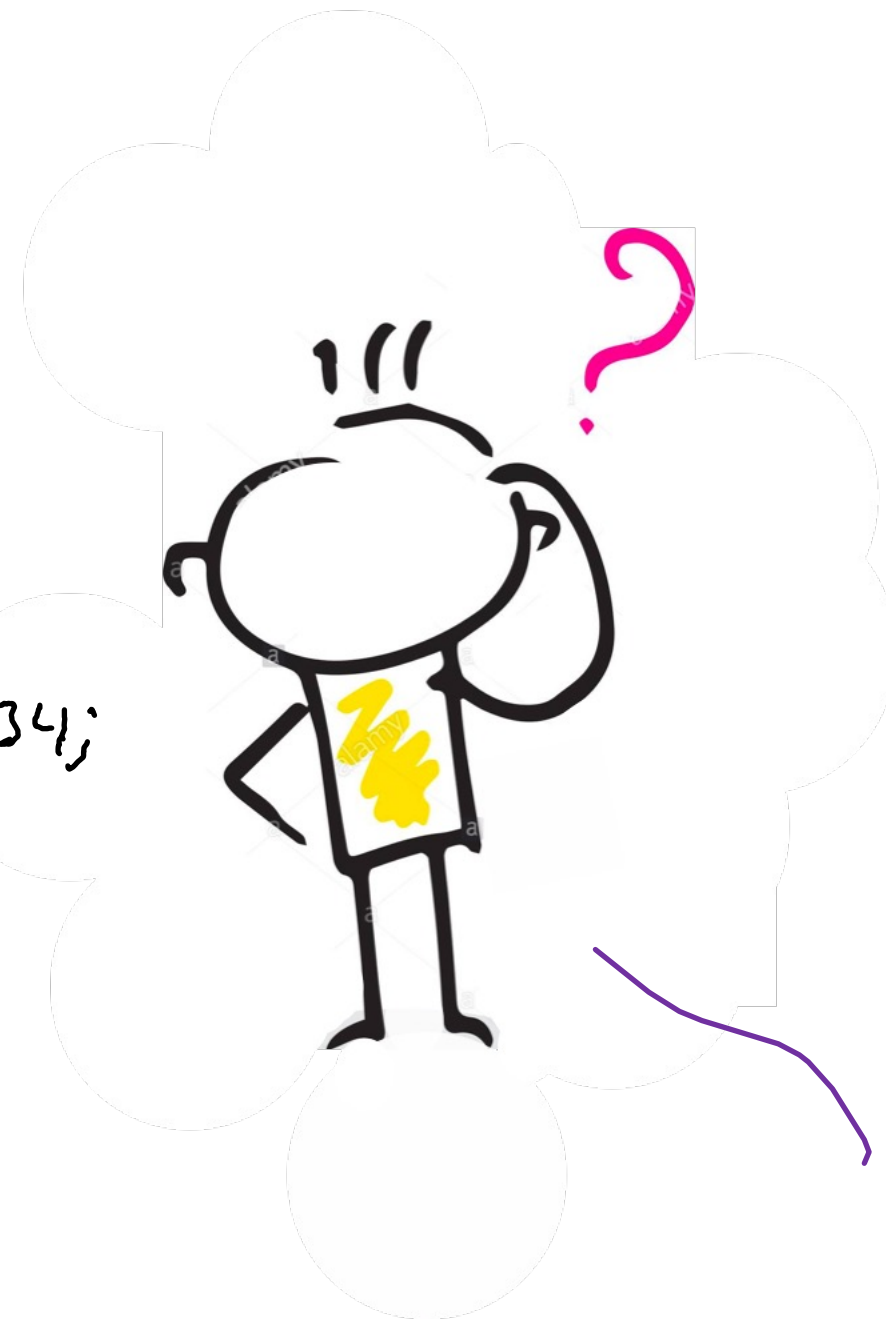
A hand-drawn circuit diagram showing a voltage source in series with a resistor labeled '3' and a parallel branch. The calculation for the current through the parallel branch is shown:

$$\frac{\frac{j}{3}(4)}{\frac{j}{3} + 4} = 0.02758i + 0.331034j$$

A hand-drawn circuit diagram showing a voltage source in series with a resistor. The calculation for the average power is shown:

$$3 \cdot 0.02758i + 0.331034j$$

→ Avg Power
3.03 W





THE OHIO STATE UNIVERSITY

COLLEGE OF ENGINEERING

Frequency Response

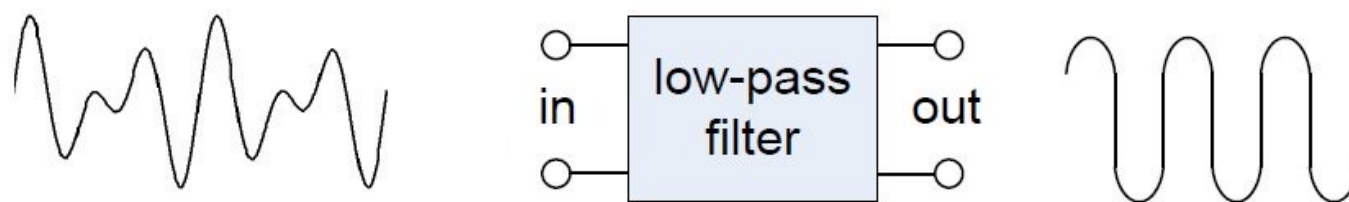


- Learning Objectives:
 - Use knowledge of the frequency response to determine what type of filter a circuit represent.
 - Generate magnitude frequency plots for high and low pass-filters.



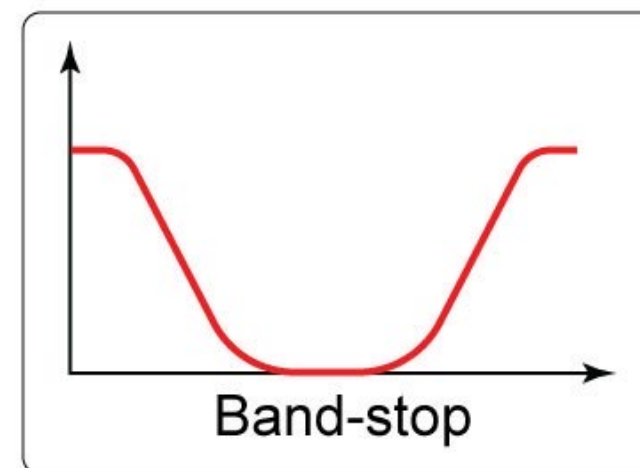
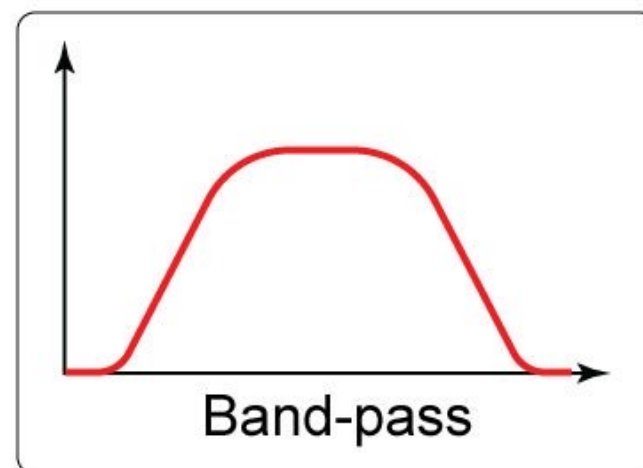
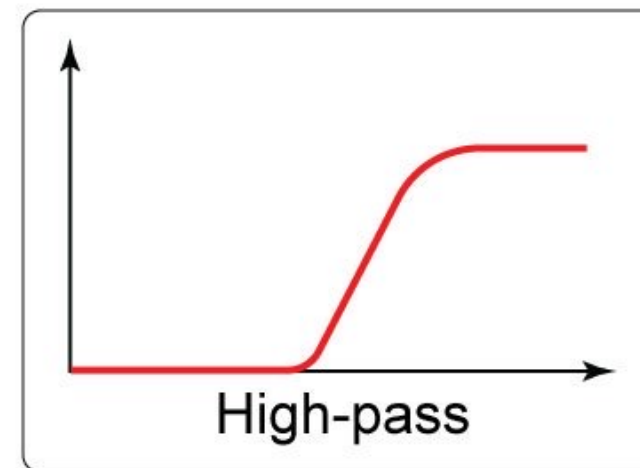
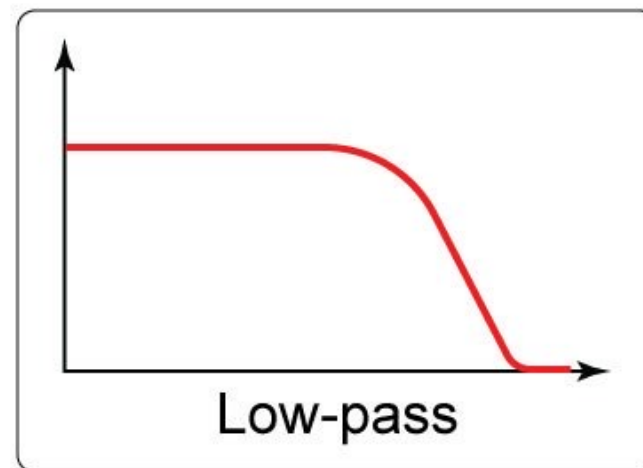


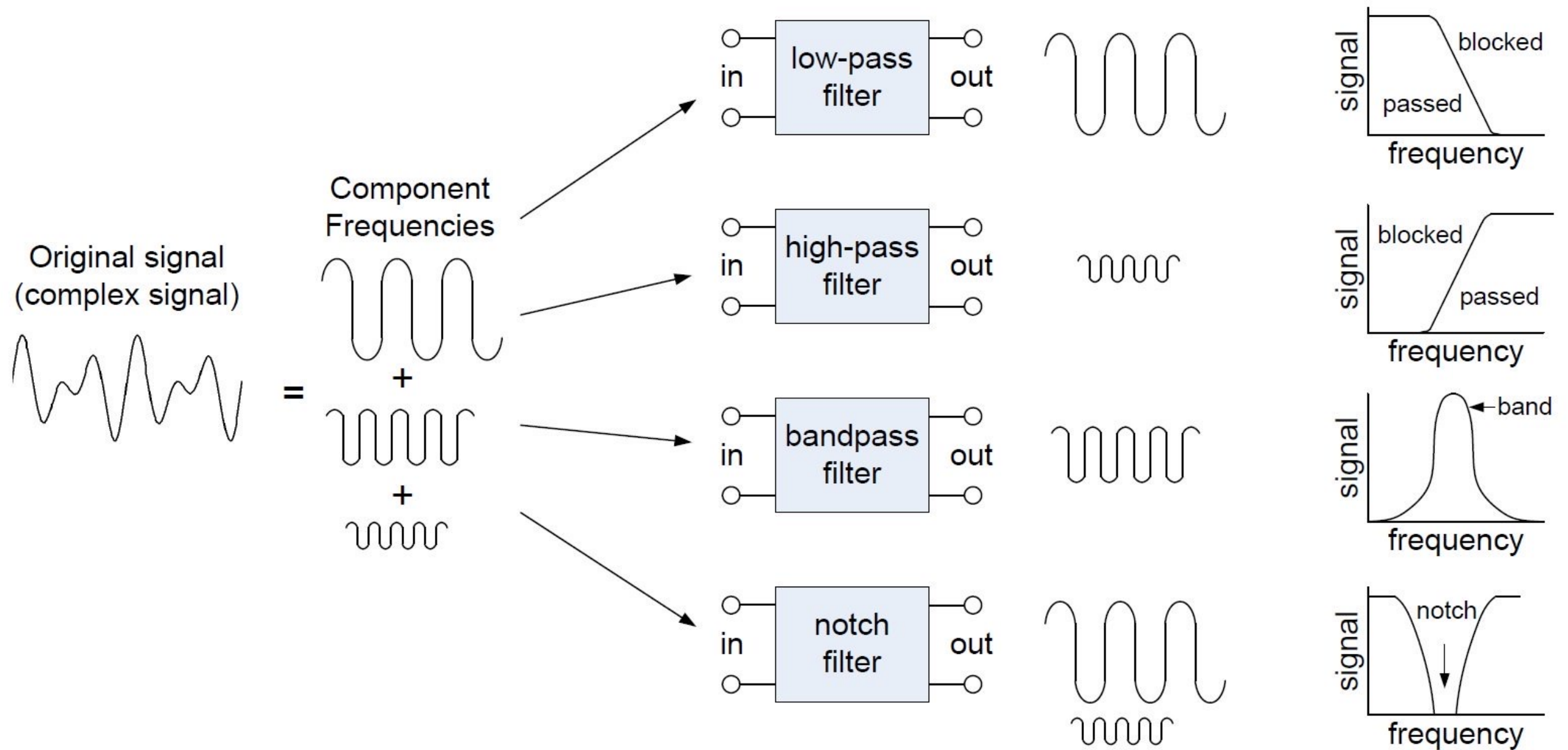
- A Passive Filter is a circuit that can be designed to modify, reshape or reject all unwanted high frequencies of an electrical signal and accept or pass only those signals wanted by the circuit designer.
- Passive filters are made up of passive components such as resistors, capacitors and inductors and have no amplifying elements (transistors, op-amps, etc) so have no signal gain, therefore their output level is always less than the input.





- Filters are so named according to the frequency range of signals that they allow to pass through them, while blocking or “attenuating” the rest. The most commonly used filter designs are the:



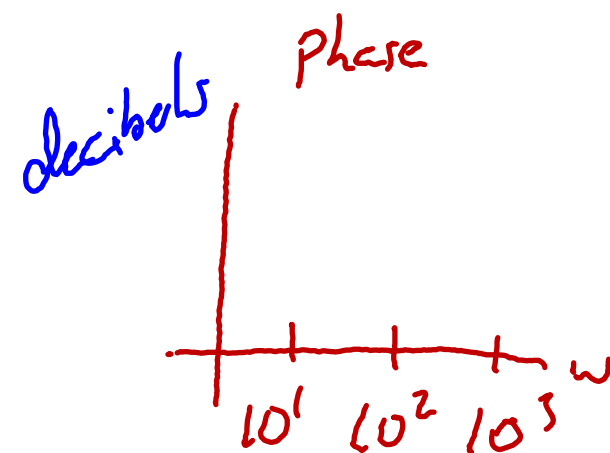




- Frequency response plots displayed as logarithmic plots.
 - Horizontal axis represents frequency in log scale (base 10).
 - Vertical axis represents amplitude or phase.

A. Amplitude expressed in units of decibels (dB).

$$\frac{V_{out}}{V_s} = \frac{\boxed{}}{\boxed{}} =$$



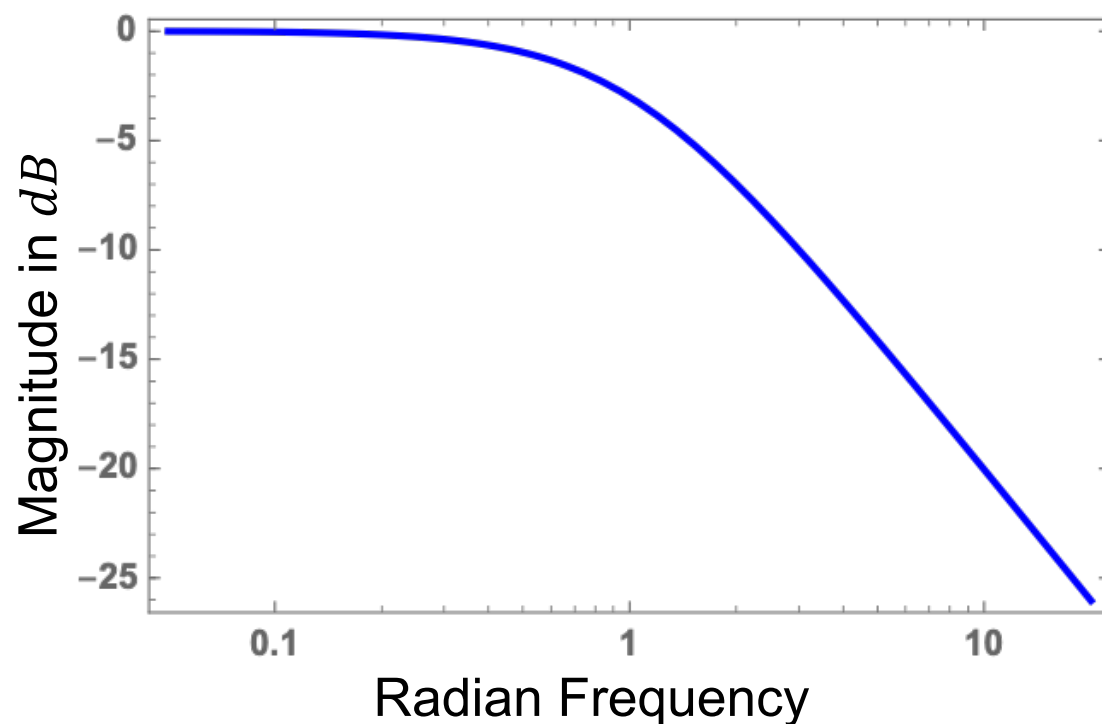
$$\begin{aligned} \left| \frac{P_{out}}{P_{in}} \right|_{dB} &= 10 \log_{10} \left(\left| \frac{P_{out}}{P_{in}} \right| \right) \\ &= 20 \log_{10} \left(\left| \frac{P_{out}^2}{P_{in}^2} \right| \right) = 20 \log_{10} (M(f)) \end{aligned}$$



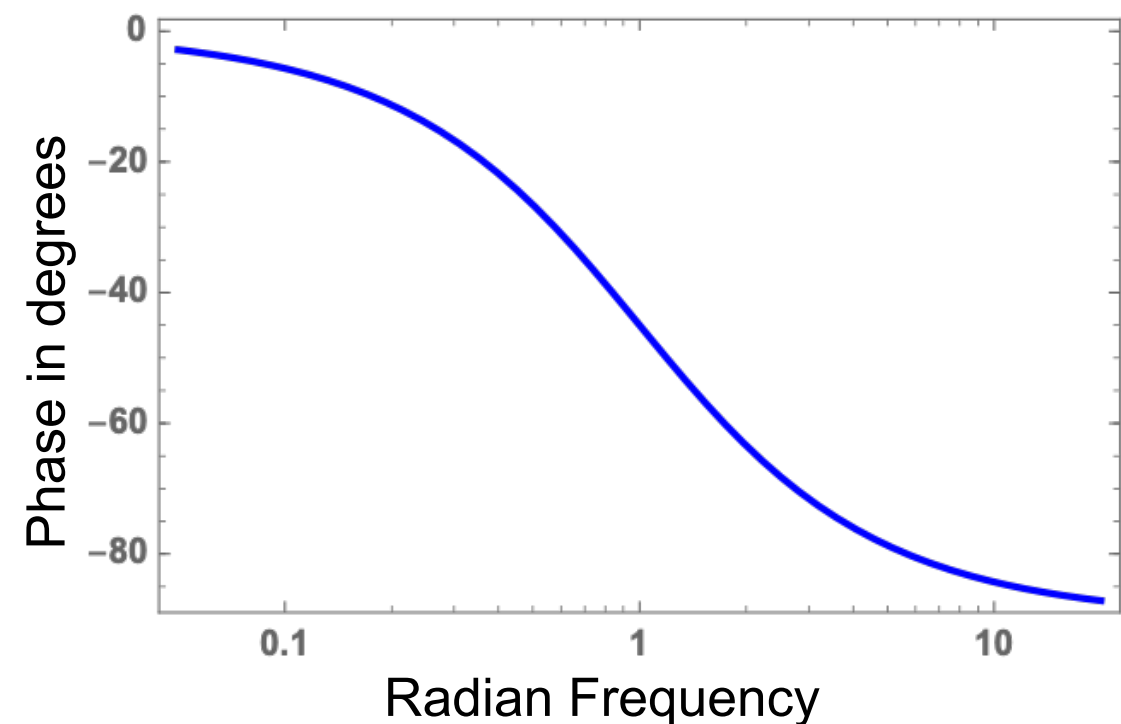
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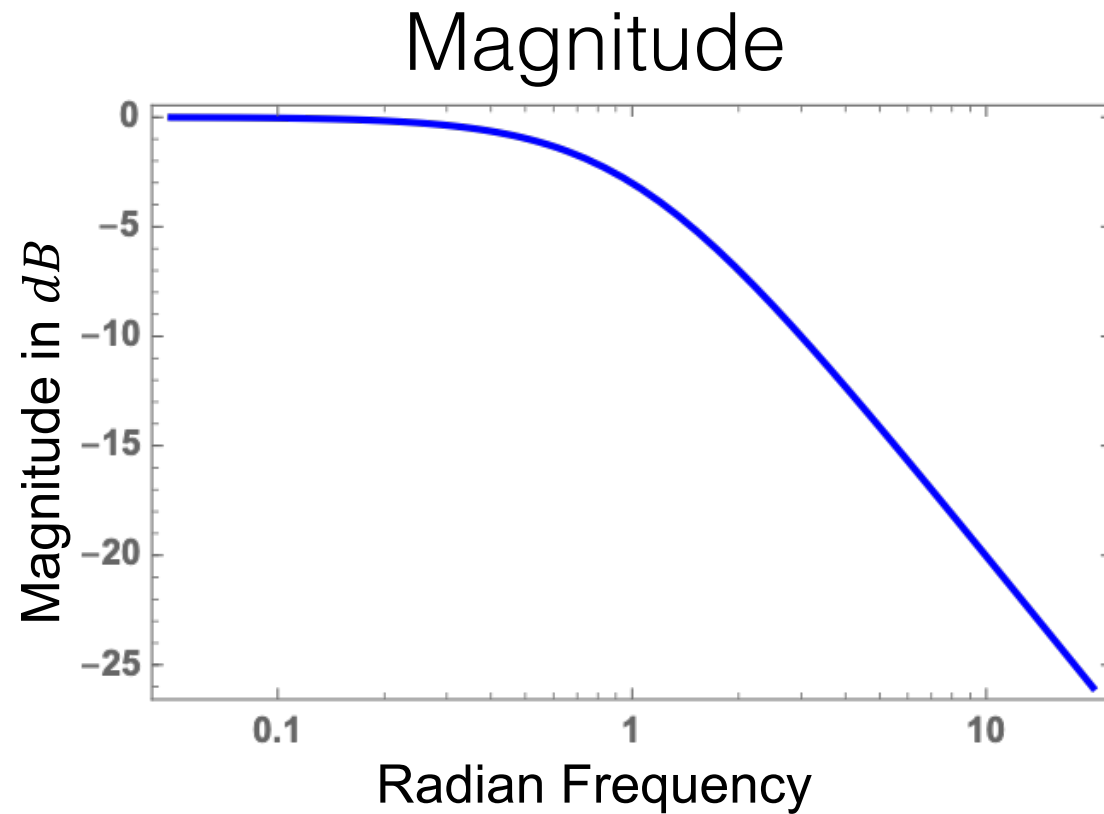
A. Amplitude expressed in units of decibels (dB).

Magnitude



Phase





When is it filtering enough??

Corner frequency or half-power frequency is the point where more signal is being filtered out than let through.

