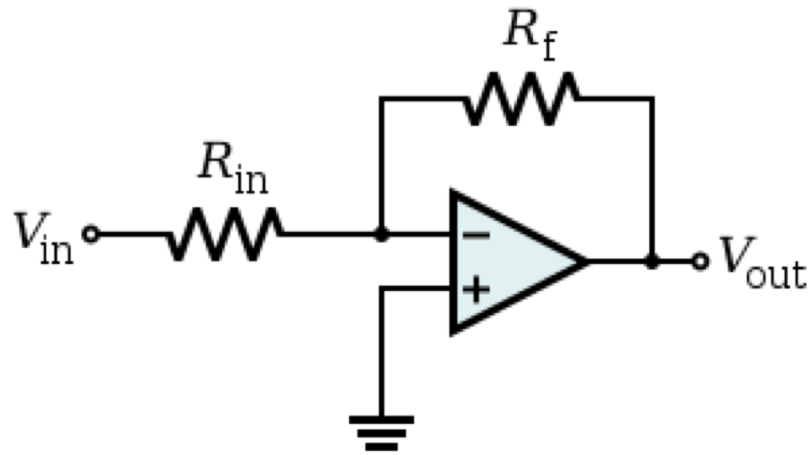
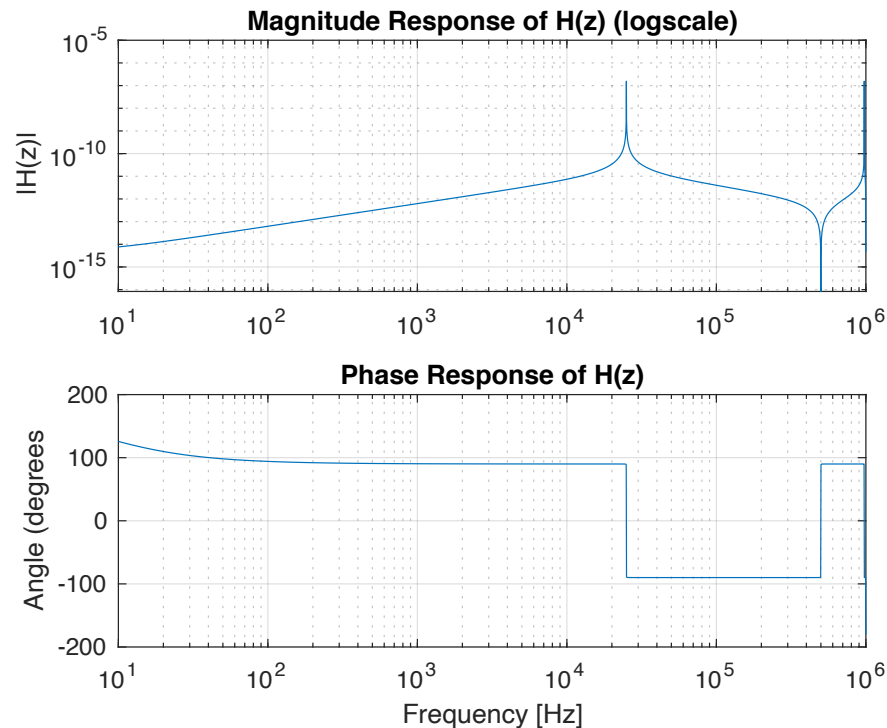


Background/pre-requisites



1. What output does the circuit produce for a sinusoidal input signal? **(This is an inverting amplifier circuit with gain $-R_f/R_{in}$. It produces a sinusoidal output with 180° phase shift relative to input)**
2. While connecting the circuit on breadboard, I accidentally interchanged the connections of the inverting and non-inverting terminals. What output does the circuit produce now? **(The circuit with positive feedback is a Schmitt trigger, which produces a square wave output)**
3. What is the input impedance of the circuit? **(In negative feedback, the inverting terminal of the op-amp is at virtual ground. Therefore input impedance is R_{in})**

Background/pre-requisites



Consider the narrow-band filter shown here with center frequency 25kHz. I connect a square wave signal (1Vp-p, 5kHz) at the input of the filter. What should I expect to see on an oscilloscope at the output of the filter?

A square wave of frequency 5kHz has only components of odd-integer harmonic frequencies (i.e. 5kHz, 15kHz, 25kHz, 35kHz etc. hint: Fourier series). Since the filter has very narrow passband centered around 25kHz, the output of the filter is a sinusoidal wave of frequency 25kHz, corresponding to the 5th harmonic of the square wave. The other frequency components of the square wave are rejected by the filter.