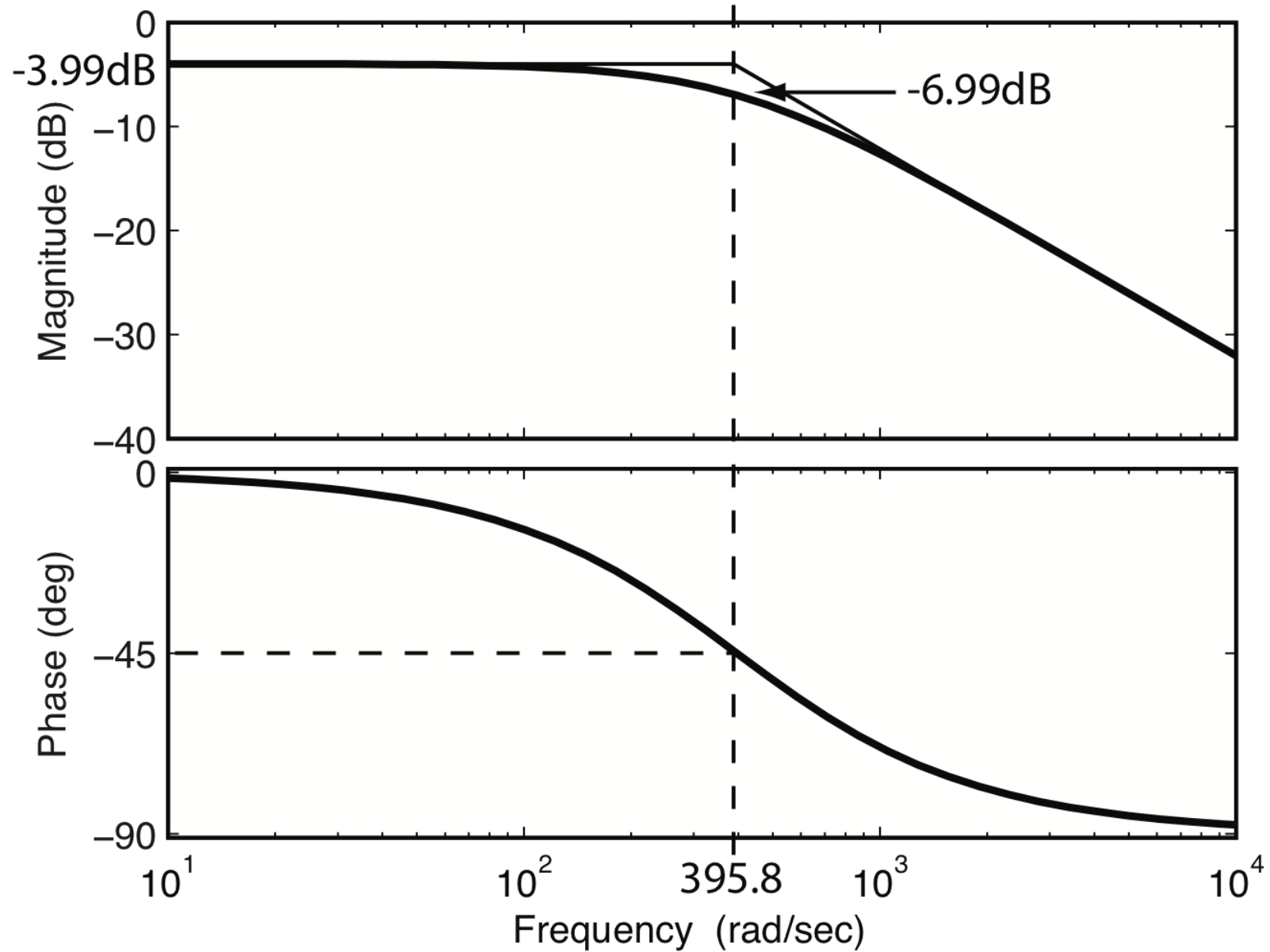


Let $R_p = 2 \text{ k}\Omega$, $a = 4$, $R_s = 6 \text{ k}\Omega$, $C_s = 500 \text{ nF}$

Draw a Bode diagram of the magnitude and phase of the frequency

response $H(j\omega) = \frac{V_s(j\omega)}{V_{in}(j\omega)}$.

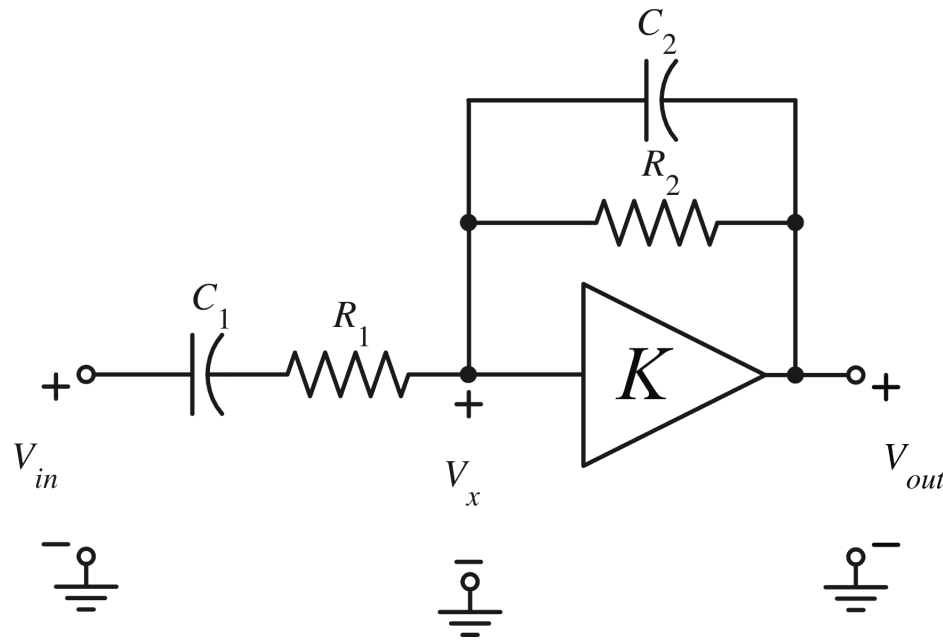
Bode Diagram



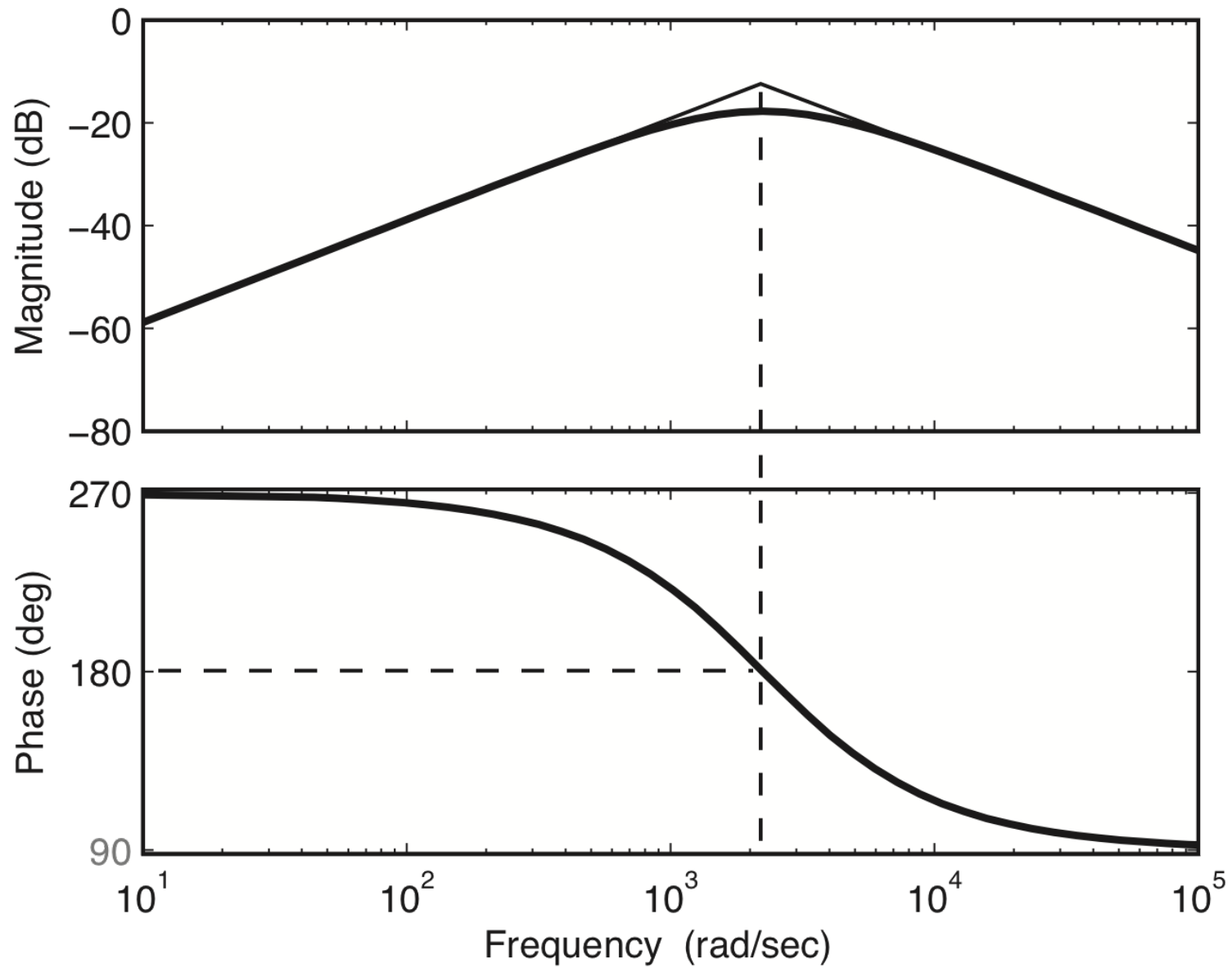
Let $C_1 = 20 \text{ nF}$, $R_1 = 20 \text{ k}\Omega$, $C_2 = 100 \text{ nF}$, $R_2 = 5 \text{ k}\Omega$ and $K = 8$.

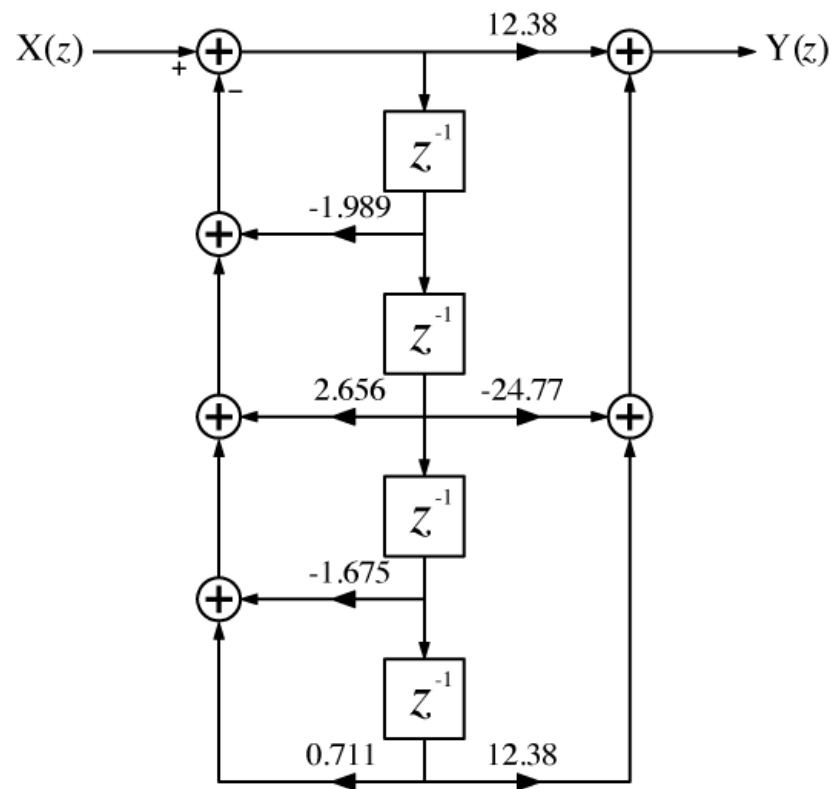
Draw a Bode diagram of the magnitude and phase of the frequency

response $H(j\omega) = \frac{V_{out}(j\omega)}{V_{in}(j\omega)}$ of this Sallen-Key bandpass filter.



Bode Diagram





A signal generator generates a constant-amplitude, variable-frequency analog sinusoid that is sampled at a rate of 1 kHz to form the input signal for this bandpass digital filter. Find the frequency of the signal generator that corresponds to the center frequency of the filter. Also find the effective -3dB bandwidth of the filter by finding the signal frequencies at which the power of the output signal is half of its value at the center frequency.

The center frequency is 159 Hz.

The half-power bandwidth is about 39.1 Hz.

A signal $x(t) = 4 \cos(2000\pi t) \cos(200\pi t)$ is sampled at its Nyquist rate.

What is the signal power of the resultant discrete-time signal $x[n]$?

$$P_x = 6$$

A signal $x(t) = 4 \cos(2000\pi t) \cos(200\pi t)$ is sampled at twice its Nyquist rate.

What is the signal power of the resultant discrete-time signal $x[n]$?

$$P_x = 4$$

It can be shown that this answer is the same for any sampling rate that is greater than the Nyquist rate. Why is this signal power less than the previous signal power?

A signal $x(t) = 4 \cos(2000\pi t) \sin(200\pi t)$ is sampled at twice its Nyquist rate.

What is the signal power of the resultant discrete-time signal $x[n]$?

$$P_x = 4$$

It can be shown that this answer is the same for any sampling rate that is greater than the Nyquist rate. This is the same as the previous signal power.

A signal $x(t) = 4 \cos(2000\pi t) \sin(200\pi t)$ is sampled at its Nyquist rate.

What is the signal power of the resultant discrete-time signal $x[n]$?

$$P_x = 2$$

Why is this signal power less than the previous two signal powers?