High-Pass RC Circuit

Introduction
A high-pass filter will pass the high-frequency Fourier components, but not those components at lower frequencies.

Problem
Obtain the complex transfer function \( H(\omega) \) for the circuit shown below over the range \( 0 < \omega < \infty \). Plot the magnitude of \( H \) and the phase angle as a function of \( \omega \) on a log scale.

Parameters
\[ C := 0.01 \mu\text{F} \quad R := 10 \text{k}\Omega \]

Solution
The complex transfer function can be written down by inspection:
\[
H(\omega) := \frac{R}{R + \frac{1}{j\omega C}}
\]

Parameters for plotting
characteristic frequency:
\[ \omega_0 := \frac{1}{R \cdot C} \quad \omega_0 = 1 \cdot 10^4 \text{ s}^{-1} \]

Low/High values to plot:
\[ \omega_{\text{low}} := .001 \cdot \omega_0 \quad \omega_{\text{high}} := 100 \cdot \omega_0 \]

Number of points:
\[ N := 400 \quad i := 0..N - 1 \]

Step size:
\[ r := \log \left( \frac{\omega_{\text{low}}}{\omega_{\text{high}}} \right) \cdot \frac{1}{N} \quad r = 0.012 \]

Range variable:
\[ \omega_i := \omega_{\text{high}} \cdot 10^i r \]
The diagram represents a Bode plot with the following axes:

- **Frequency (ω_i)**: Radians/sec
- **Amplitude (20 \cdot \log_{10} |H(ω_i)|)**

The plot shows the variation of the amplitude response with respect to frequency. The horizontal axis (ω_i) ranges from 10 to 1 \times 10^6 radians/sec, and the vertical axis represents the decibel (dB) scale.