Frequency Response

![Graph showing frequency response](image-url)
Bode Plot – Frequency Response

\[ |H| \text{ (Log Scale)} \]

\[ \Delta H [^\circ] \]

\[ \text{frequency [Hz] (Log Scale)} \]
Fourier Series

Assume we have some function $f(t)$ which is periodic with period $T_0 = \frac{2\pi}{\omega_0}$

$$f(t) = a_0 + \sum_{k=1}^{\infty} a_k \cos(k\omega_0 t) + b_k \sin(k\omega_0 t)$$

$f(t)$ can be expressed this way if

1. $f(t)$ is single-valued
2. $\int_{t_0}^{t_0+T_0} |f(t)| \, dt$ exists
3. $f(t)$ had finite discontinuities and max/min per period
Application: Digital Communication
Applying Superposition

![Plot of voltage waveform over time]
Calculated Output Voltage

![Graph of Calculated Output Voltage](image)
Simulation Verification

Simulation graphs showing input voltage $V_{in}$ and output voltage $V_{out}$ over time [ns]. The circuit diagram includes a pulse function PULSE(0 1.2 0 1p 1p 125p 250p) with a .tran command specifying the simulation time from 0 to 1u with a 1u to 1.25n time range.
Frequency Domain Interpretation

<table>
<thead>
<tr>
<th>H(jω)</th>
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F[V_{in}]  
F[V_{in}] |H(jω)|

\[ |H(j\omega)| \]

\[ F[V_{in}] \]

\[ F[V_{in}] |H(j\omega)| \]
PULSE(0 1.2 0 1p 1p 125p 250p)
.tran 0 1u {1u-1.25n}