Part III : Fourier Methods

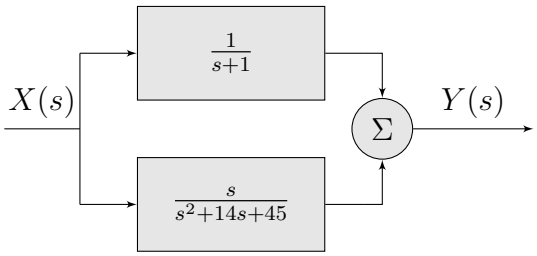
1. Consider the signal $x(t) = 2\cos(10\pi t) + \sin(19\pi t)$

   (a) Determine the Fourier-Series representation in exponential form if it exists.

   (b) What is system response when $x(t)$ is applied to a system with Transfer Function $H(s) = \frac{s}{s^2+3s+2}$?

2. Determine the Fourier Transform of $x(t) = (1 + te^{-t})\cos(2\pi t)$ if possible.

3. Given the following block diagram, determine the output in the Fourier Domain, $Y(\omega)$ when $x(t) = \text{sinc}(2\pi t)$

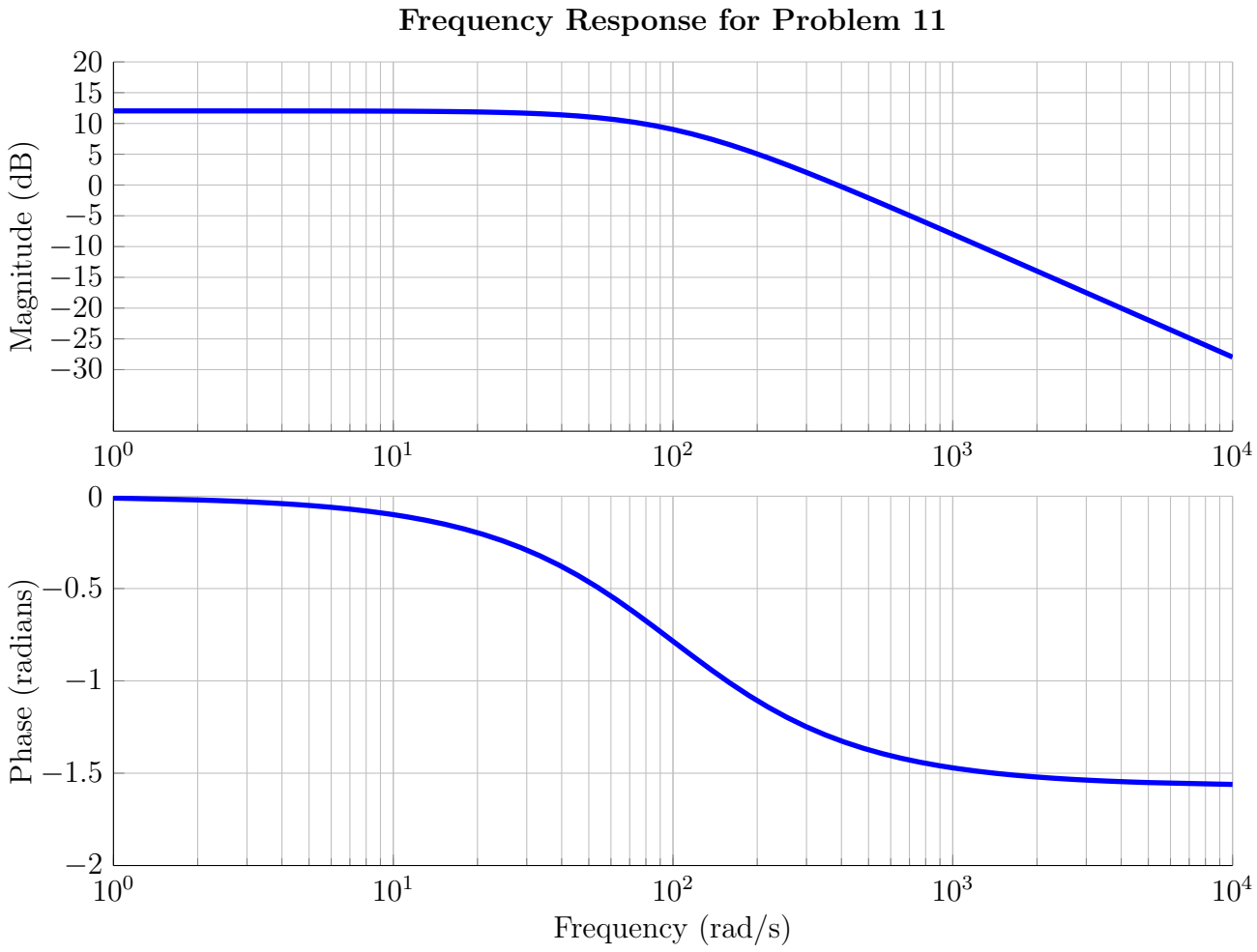


4. Consider the following Bode plot that corresponds to a LTI system (note carefully the units of the axes). What is the output when the input is:

   (a) $x(t) = 1$

   (b) $x(t) = \sin(400t)$

   (c) $x(t) = \cos(10000t)$


Frequency Response for Problem 11
Magnitude (dB)
20
15
10
5
0
−5
−10
−15
−20
−25
−30
10^0
10^1
10^2
10^3
10^4
Phase (radians)
0
−0.5
−1
−1.5
−2
10^0
10^1
10^2
10^3
10^4
Frequency (rad/s)