Problem 1 (15 points)
Consider the periodic signal $x(t)$ shown below:

\[ \ldots \quad \uparrow \quad \uparrow \quad \uparrow 2 \quad \uparrow \quad \uparrow \quad \ldots \]
\[ \begin{array}{cccccccc}
-10 & -5 & 0 & 5 & 10 & \ldots \\
\end{array} \]

(a) Determine the Fourier series representation of the signal $x(t)$.

(b) The signal $x(t)$ is the input to an LTI system with the real frequency response $H(\omega)$ shown below:

\[ H(\omega) \]
\[ \begin{array}{cccc}
-\pi & -\frac{\pi}{2} & \frac{\pi}{2} & \pi \\
\end{array} \]

Determine the output $y(t)$ of the system.
Suppose that the input to an LTI system is $x(t)$ given below. The corresponding output is $y(t)$, also given below.

$$x(t) = 3 \cos \left( 5\pi t + \frac{\pi}{2} \right) + 5 \cos(15\pi t).$$

$$y(t) = 30 \cos (5\pi t) + 25 \cos \left( 15\pi t - \frac{3\pi}{2} \right)$$

Could the system have the frequency response given below? Why or why not?

$$|H(j\omega)|$$

$$\angle H(j\omega) = -\frac{\omega}{10}$$