(1) The function

\[ f(x) = \begin{cases} 
0 & -\pi \leq x < -\pi/2, \\
1 & -\pi/2 \leq x < \pi/2, \\
0 & \pi/2 \leq x \leq \pi, 
\end{cases} \]

can be extended to be periodic of period \(2\pi\). Sketch the graph of the resulting function, and compute its Fourier series.

(2) The function

\[ f(t) = |x|, \quad \text{for } x \in [-\pi, \pi] \]

can be extended to be periodic of period \(2\pi\). Sketch the graph of the resulting function, and compute its Fourier series.

(3) The function

\[ f(x) = \begin{cases} 
0 & -\pi \leq x < 0, \\
x & 0 \leq x \leq \pi, 
\end{cases} \]

can be extended to be periodic of period \(2\pi\). Sketch the graph of the resulting function, and compute its Fourier series.

(4) Consider the \(2\pi\)-periodic function defined by

\[ f(x) = \begin{cases} 
x^2 & -\pi \leq x < \pi, \\
f(x - 2k\pi) & -\pi + 2k\pi \leq x < \pi + 2k\pi. 
\end{cases} \]

Sketch this function and compute its Fourier series.

(5) Find the Fourier series of the following functions without computing any integrals.
   (a) \( f(x) = 2 - 3 \sin 4x + 5 \cos 6x \).
   (b) \( f(x) = \sin^2 x \) [Hint: Use a standard trig identity.]

(6) Determine which of the following functions are even, which are odd, and which are neither even nor odd:
   (a) \( f(t) = x^3 + 3x \).
   (b) \( f(t) = x^2 + |x| \).
   (c) \( f(t) = e^x \).
   (d) \( f(t) = \frac{1}{2}(e^x + e^{-x}) \).
   (e) \( f(t) = \frac{1}{2}(e^x - e^{-x}) \).