(1) The function
\[ f(t) = \begin{cases} 
0 & -\pi \leq t < \pi/2, \\
1 & -\pi/2 \leq t < \pi/2, \\
0 & \pi/2 \leq t \leq \pi,
\end{cases} \]
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
\[ f(t) = |t|, \quad \text{for } t \in [-\pi, \pi] \]
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
\[ f(t) = \begin{cases} 
0 & -\pi \leq t < 0, \\
t & 0 \leq t \leq \pi,
\end{cases} \]
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
\[ f(t) = \begin{cases} 
t^2 & -\pi \leq t < \pi, \\
f(t - 2k\pi) & -\pi + 2k\pi \leq t < \pi + 2k\pi.
\end{cases} \]
Sketch this function and compute its Fourier series.

(5) Find the Fourier series of the function \( f(t) = 2 - 3\sin 4t + 5\cos 6t \), and sketch the graph of this function (use your calculator). \textit{Hint: this problem is simple – don’t do any integrals!}

(6) Sketch the graph of the function \( f(t) = \sin^2 t \) and find its Fourier series. \textit{Hint: Don’t do any integrals! Instead, use a standard trig identity.}

(7) Which functions from the previous exercises had only cosine terms in their Fourier series expansion? Which functions only had sine terms? Which had both? Do you see a pattern? \textit{Hint: compare the symmetries of the graphs of these functions to the symmetries of the graphs of sine waves and cosine waves.}