For this homework assignment, you may use Mathematica to help compute integrals; if you do, submit your Mathematica output with your homework.

For problems 1 - 3 find the complex Fourier series for the functions indicated. Calculate the Fourier coefficients and write out the first three non-zero pairs of terms of the series.

1. \( f(x) = x^2, \quad -\pi < x < \pi \)
2. \( f(x) = \text{Abs}[x], \quad -\pi < x < \pi \)
3. \( f(x) = e^{ax}, \quad -\pi < x < \pi \) (a is a real number)

For problems 4 - 7, find the trigonometric Fourier series for the functions indicated; be sure to take into account the interval specified. Calculate the Fourier coefficients and write out the first three non-zero terms.

4. \( f(x) = \begin{cases} 1, & 0 < x < \pi / 2 \\ 0, & \pi / 2 < x < 2\pi \end{cases} \)
5. \( f(x) = \sin(x/2), \quad 0 < x < 2\pi \)
6. \( f(x) = \begin{cases} 0, & -2 < x < 0 \\ x, & 0 < x < 2 \end{cases} \)
7. \( f(x) = \begin{cases} 0, & -3 < x < 0 \\ 1, & 0 < x < 1 \end{cases} \)

8. Use Mathematica to plot your Fourier Series for the interval \(-7 < x < 5\). Submit your output with your homework.