MATH2065
Introduction to Partial Differential Equations
Semester 2 – Practice Questions (Week 9)

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1. Given the function defined on $[-\pi, \pi]$ by

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

with period 2π, $f(x + 2\pi) = f(x)$.

(a) Sketch $f(x)$ for $-3\pi < x < 3\pi$

(b) Calculate the Fourier Series for $f(x)$

(c) Evaluate the Fourier Series at $x = 0$ and hence find the sum

$$1 + \frac{1}{3^2} + \frac{1}{5^2} + \frac{1}{7^2} + \cdots$$

(d) Explain the behaviour of the Fourier Series at $x = \pi$.