



4. Let  $f(x)$  be the periodic function with period  $2\pi$  given by

$$f(x) = \begin{cases} -1 & \text{if } -\pi < x < 0 \\ 0 & \text{if } 0 < x < \frac{\pi}{2} \\ 2 & \text{if } \frac{\pi}{2} < x < \pi \end{cases}$$

(a) If we evaluate the Fourier series expansion of  $f(x)$  at  $x = \pi$ , what value will we get and why? (Note: you do not need to find the Fourier series in order to answer this question.)

(b) Compute  $a_0$  in the Fourier series expansion of  $f(x)$ .

(c) Compute  $a_5$  in the Fourier series expansion of  $f(x)$ .

(d) Compute  $c_5$  in the complex form of the Fourier series expansion of  $f(x)$ .

Bonus. (Optional; work on this only if you have extra time at the end.) What is  $i^i$ ?