

**Course 2E02 2013 (SF Engineers & MSISS & MEMS)****S h e e t 8**

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Due: at the end of the tutorial

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**Exercise 1**

Find the Fourier series of the function

$$f(x) = \begin{cases} 1 & \text{if } -\pi \leq x < 0 \\ -2 & \text{if } 0 \leq x \leq \pi; \end{cases}, \quad -\pi \leq x \leq \pi.$$

**Exercise 2**

Which systems of functions are orthogonal with respect to the inner product

$$\langle f, g \rangle = \int_{-\pi}^{\pi} f(x)g(x) dx :$$

- (i)  $\{1, x, -\cos x\}$ ;
- (ii)  $\{1, -\sin \frac{x}{2}, \sin 2x\}$ ;
- (iii)  $\{1, -x, x^2\}$ .