

## Chapter 17: Fourier Series

---

### Exercise 17(a)

1. Sketch one complete cycle of the following functions with period  $2\pi$ :

(a)

$$f(t) = \begin{cases} -5 & -\pi < t < 0 \\ 5 & 0 < t < \pi \end{cases}$$

(b)

$$f(t) = \begin{cases} \frac{3\pi}{2} & -\frac{3\pi}{2} < t < -\frac{\pi}{2} \\ \frac{\pi}{2} & -\frac{\pi}{2} < t < \frac{\pi}{2} \end{cases}$$

(c)

$$f(\omega t) = \begin{cases} 5\omega t & 0 < \omega t < \pi \\ -5\omega t & \pi < \omega t < 2\pi \end{cases}$$

(d)

$$f(t) = \begin{cases} \sin(t) & 0 < t < \pi \\ 0 & \pi < t < 2\pi \end{cases}$$

(e)

$$f(\omega t) = \begin{cases} -\omega t & -\pi < \omega t < -\frac{\pi}{2} \\ 1 & -\frac{\pi}{2} < \omega t < 0 \\ \omega t & 0 < \omega t < \frac{\pi}{2} \\ \frac{\pi}{2} & \frac{\pi}{2} < \omega t < \pi \end{cases}$$

2. Sketch *two* complete cycles of the following functions with the corresponding periods:

(a)

$$f(t) = \begin{cases} t^2 & -1 < t < 1 \\ 1 & 1 < t < 3 \end{cases} \quad \text{with period} = 4$$

(b)

$$f(\omega t) = \begin{cases} -\omega t & -\frac{1}{2} < \omega t < 0 \\ \omega t & 0 < \omega t < \frac{1}{2} \end{cases} \quad \text{with period} = 1$$

(c)

## Chapter 17: Fourier Series

---

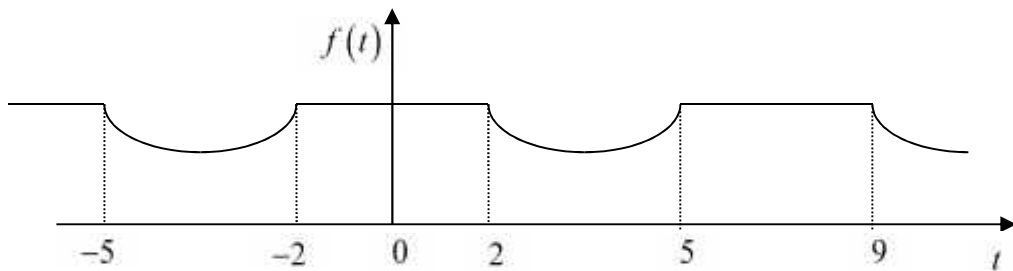
$$f(t) = \begin{cases} \sin(2t) & -\frac{\pi}{2} < t < 0 \\ 0 & 0 < t < \frac{\pi}{2} \end{cases} \quad \text{with period} = \pi$$

(d)

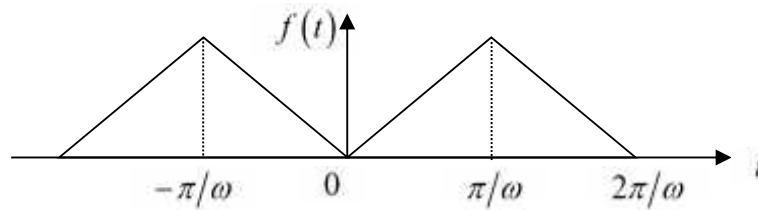
$$f(t) = \begin{cases} e^{-t} & -1 < t < 0 \\ e^t & 0 < t < 1 \end{cases} \quad \text{with period} = 2$$

3. State the periods of the following functions:

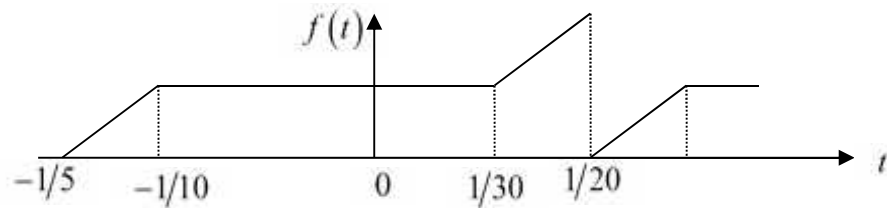
(a)



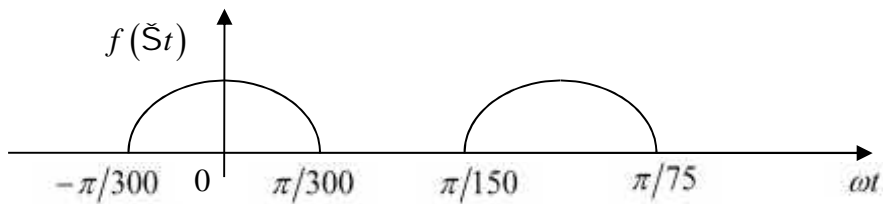
(b)



(c)



(d)



## Chapter 17: Fourier Series

---

### Brief Solutions

3. (a) 7      (b)  $\frac{2\pi}{\omega}$       (c)  $\frac{1}{4}$       (d)  $\frac{\pi}{100}$