



# TOBB EKONOMİ VE TEKNOLOJİ ÜNİVERSİTESİ

## MAK 501 ENGINEERING MATHEMATICS

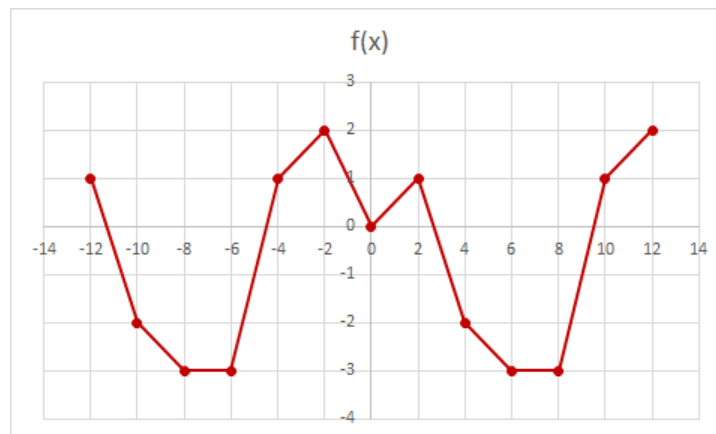
FALL 2016

Due Date: 14.10.2016- Friday\* (18:30)

### HOMEWORK 2

1. Work out the Fourier series of  $f$ , given over as follows. At which values of  $x$ , if any, does the series fail to converge to  $f(x)$ ? To what values does it converge at those points?

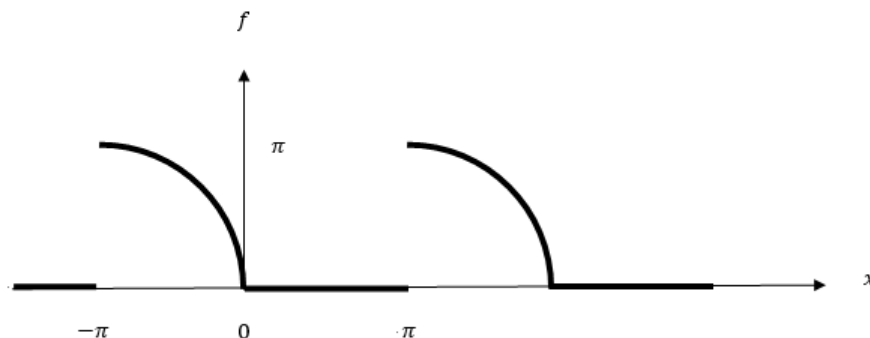
$f$  is a periodic function, the graph of which is given in the following figure.



2. Obtain a computer plot of the partial sums of the Fourier series of the periodic function shown in question 1 for

a)  $n=1$  b)  $n=3$  c)  $n=5$  d)  $n=15$

3. Let  $f$  be the periodic function shown in the following figure. Find the Fourier series of  $f$ .



Note:

$J_n$ 's denote Bessel functions of first kind. You may use any of these formulas:

$$\cos(a \sin \theta) = J_0 + 2J_2 \cos 2\theta + 2J_4 \cos 4\theta + \dots$$

$$\sin(a \sin \theta) = 2J_1 \sin \theta + 2J_3 \sin 3\theta + 2J_5 \sin 5\theta + \dots$$

$$\cos(a \cos \theta) = J_0 - 2J_2 \cos 2\theta + 2J_4 \cos 4\theta + \dots$$

$$\sin(a \cos \theta) = 2J_1 \cos \theta - 2J_3 \sin 3\theta + 2J_5 \cos 5\theta + \dots$$

where  $J_n$ 's are shorthand for  $J_n(a)$ .

4. For the following function, sketch the Fourier sine series of  $f(x)$  and determine its Fourier coefficient:

$$f(x) = \begin{cases} 1 & x < L/6 \\ 2 & L/6 < x < L/3 \\ 0 & x > L/3 \end{cases}$$

5. Drive quarter-range cosine expansion, and the quarter-range sine expansion (*given in Chapter 17.4 of Advanced Engineering Mathematics*) by similar procedure on Chapter 17.4 of Advanced Engineering Mathematics (Greenberg).

Due date is **Friday 14th of October**. For each day delay **15 points** will be reduced.

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