TMA4123 Matematikk
4M
Vår 2007

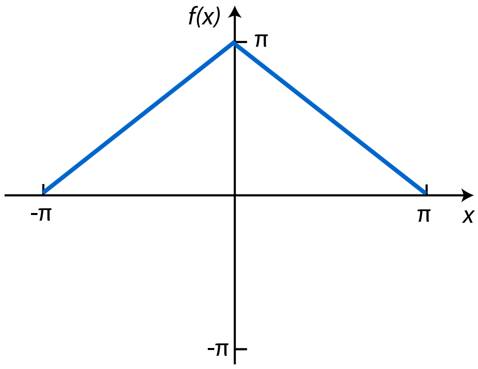
Norwegian University of Science
and Technology
Institutt for matematiske fag

Exercise set 9

Exercises from Kreyszig (9th ed):

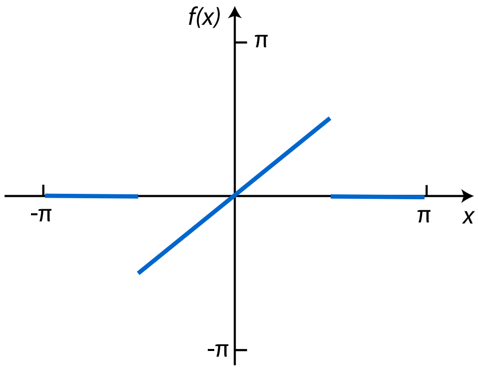
$\boxed{1}$ *Exercise 11.1.15*

Showing the details of your work, find the Fourier series of the given $f(x)$, which is assumed to have the period 2π. You do not need to sketch the partial sums.



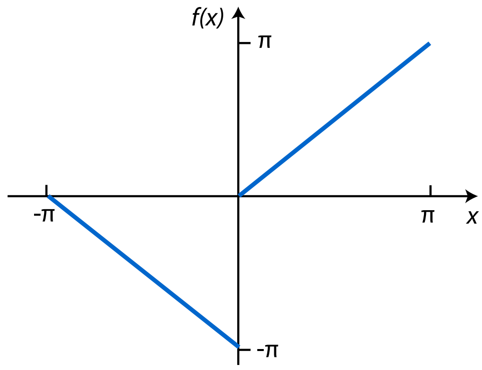
$\boxed{2}$ *Exercise 11.1.16*

Showing the details of your work, find the Fourier series of the given $f(x)$, which is assumed to have the period 2π. You do not need to sketch the partial sums.



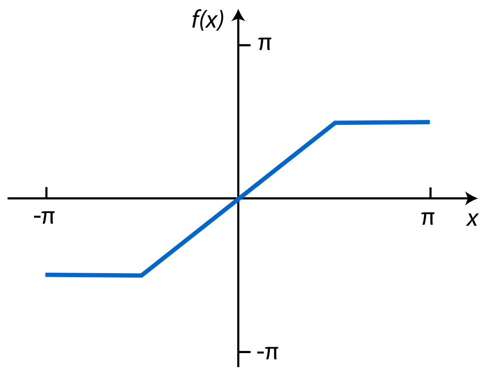
$\boxed{3}$ *Exercise 11.1.19*

Showing the details of your work, find the Fourier series of the given $f(x)$, which is assumed to have the period 2π. You do not need to sketch the partial sums.



4 *Exercise 11.1.20*

Showing the details of your work, find the Fourier series of the given $f(x)$, which is assumed to have the period 2π. You do not need to sketch the partial sums.



5 *Exercise 11.6.12*

Using Parseval's identity, prove that the series have the indicated sum. Compute the first few partial sums to that the convergence is rapid.

$$1 + \frac{1}{3^4} + \frac{1}{5^4} + \frac{1}{7^4} + ... = \frac{\pi^4}{96} = 1.014678032$$

Use Problem 11.1.15.

Exercises from Kreyszig (8th ed):

6 *Exercise 17.1.3*

Small differences of large numbers may be particularly strongly affected by rounding errors. Illustrate this by computing $0.81534/(35.724 - 35.596)$ as given with $5S$ (5 significant digits), then rounding stepwise to $4S$, $3S$ and $2S$, where 'stepwise' means: round the rounded numbers, not the given ones.

7 *Exercise 17.1.5*

Write the quotient $a/(b-c)$ in Prob. 17.1.3 as $a(b+c)/(b^2-c^2)$. Compute it first with $5S$, then round the numerator 58.150 and the denominator 9.1290 stepwise as in Prob 17.1.3. Compare and comment.

$\boxed{8}$ *Exercise 17.1.9*

(Change of formula) How can we get good values of $\sqrt{9+x^2}-3$ if $|x|$ is small?

$\boxed{9}$ *Exercise 17.2.1*

Why do we obtain a monotone sequence in Example 1, but not in Example 2?

$\boxed{10}$ *Exercise 17.2.2*

Perform the iterations indicated at the end of Example 2. Sketch a figure similar to Fig. 395.

$\boxed{11}$ *Exercise 17.2.17*

(Vibrating beam) Find the solution of $\cos x \cosh x = 1$ near $x = \frac{3}{2}\pi$ to $6S$-accuracy. (This determines a frequency of a vibrating beam; see Problem set 11.4.)

$\boxed{12}$ *Exercise 17.2.21*

Solve the given problem by the secant method, using x_0 and x_1 as indicated.

$$\text{Prob. 17, } x_0 = 4,\ x_1 = 5$$

Non-Kreyszig exercise:

$\boxed{13}$ Formuler Newtons metode for systemet:

$$\begin{aligned} x^2 + xy^3 - 9 &= 0 \\ 3x^2y - y^3 - 4 &= 0. \end{aligned}$$

Bruk startverdiene $x_0 = 1.2$ og $y_0 = 2.5$ og utfør to iterasjoner.

$\boxed{14}$ Bruk Lagrangeinterpolasjon for å finne et polynom av grad 3 som interpolerer datasettet

x_i	-1	0	2	3
y_i	2	0	2	0

$\boxed{15}$ Interpoler $f(x) = \sin(x)$ i punktene 0, $\pi/2$ og π med et polynom av grad 2. Bruk det interpolerende polynomet for å approksimere $\sin(\pi/4)$. Bruk feilformelen(side 851 i ed.8) til å finne en skranke for feilen i approksimasjonen.