



Norwegian University of Science
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TMA4123 / TMA4125
Matematikk 4M/N
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Exercise set 2

Kreyszig (8th ed): 10.3.9 Find the Fourier series of the periodic function $f(x)$, of period $p = 2L$, and sketch $f(x)$ and the first three partial sums. (Show the details of your work.)

$$f(x) = \begin{cases} 0 & \text{if } -1 < x < 0 \\ x & \text{if } 0 < x < 1 \end{cases}, \quad p = 2L = 2$$

Kreyszig (8th ed): 10.4.2 Are the following functions odd, even, or neither odd or even?

$$x + x^2, |x|, e^x, e^{x^2}, \sin^2 x, x \sin x, \ln x, x \cos x, e^{-|x|}$$

Kreyszig (8th ed): 10.4.7 Are the following function $f(x)$, which is assumed to be periodic, of period 2π , even, odd or neither even or odd?

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

Kreyszig (8th ed): 10.4.13 State whether the given function is even or odd. Find its Fourier series. Sketch the function and some partial sums. (Show the details of your work.)

$$f(x) = \begin{cases} x & \text{if } -\pi/2 < x < \pi/2 \\ \pi - x & \text{if } \pi/2 < x < 3\pi/2 \end{cases}$$

Kreyszig (8th ed): 10.4.15 State whether the given function is even or odd. Find its Fourier series. Sketch the function and some partial sums. (Show the details of your work.)

$$f(x) = x^2/2, \quad -\pi < x < \pi$$

Kreyszig (8th ed): 10.4.19 Use problem 15 to show that

$$1 - \frac{1}{4} + \frac{1}{9} - \frac{1}{16} + \dots = \frac{\pi^2}{12}.$$

Kreyszig (8th ed): 10.4.23 Find the Fourier cosine series as well as the Fourier sine series. Sketch $f(x)$ and its two periodic extensions. (Show the details.)

$$f(x) = \pi - x, \quad 0 < x < \pi$$

8 Let f be a 2π -periodic function and

$$f(x) \sim a_0 + \sum_{k=1}^{\infty} (a_k \cos kx + b_k \sin kx)$$

be its Fourier series. Find the Fourier series of $f(-x)$.

9 Verify the formulas for the coefficients in the half-range expansions. (In the same way as we did the formula for a_0 in class.)

Kreyszig (8th ed): 12.1.4 Let $z_1 = 4 + 3i$ and $z_2 = 2 - 5i$. Find the following in the form $x + iy$, showing the details of your work:

$$(3z_1 - z_2)^2$$

Kreyszig (8th ed): 12.1.7 Let $z_1 = 4 + 3i$ and $z_2 = 2 - 5i$. Find the following in the form $x + iy$, showing the details of your work:

$$\operatorname{Re}(z_1^3), (\operatorname{Re} z_1)^3$$

Kreyszig (8th ed): 12.1.9 Let $z_1 = 4 + 3i$ and $z_2 = 2 - 5i$. Find the following in the form $x + iy$, showing the details of your work:

$$z_1 \bar{z}_2, \bar{z}_1 z_2$$

Kreyszig (8th ed): 12.1.13 Let $z = x + iy$. Find (showing the details of your work)

$$\operatorname{Im}(1/z)$$

Kreyszig (8th ed): 12.1.15 Let $z = x + iy$. Find (showing the details of your work)

$$(1 + i)^{16}$$