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

$$f(x) = \int_0^\infty [A(w)\cos wx + B(w)\sin wx]\, dw \tag{1}$$

$$f(x) = \int_0^\infty A(w)\cos wx\, dw \tag{2}$$

$$f(x) = \int_0^\infty B(w)\sin wx\, dw \tag{3}$$

Kreyzsig (8th ed): 10.8.2 Using (1), (2) or (3), show that the given integral represent the indicated function. (Can you see that the integral tells you which formula to use? Show the details of your work.)

$$\int_0^\infty \frac{\sin w \cos xw}{w}\, dw = \begin{cases} \pi/2 & \text{if} \quad 0 \le x < 1 \\ \pi/4 & \text{if} \quad x = 1 \\ 0 & \text{if} \quad x > 1 \end{cases}$$

Kreyzsig (8th ed): 10.8.6 Using (1), (2) or (3), show that the given integral represent the indicated function. (Can you see that the integral tells you which formula to use? Show the details of your work.)

$$\int_0^\infty \frac{w^3 \sin xw}{w^4 + 4}\, dw = \frac{\pi}{2} e^{-x} \cos x \quad \text{if} \quad x > 0$$

Kreyzsig (8th ed): 10.8.16 Represent the following function $f(x)$ in the form (3)

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

Kreyzsig (8th ed): 10.10.4 Find the Fourier transform of the following function $f(x)$ (without using Table III, Sec. 10.11). Show the details of your work.

$$f(x) = \begin{cases} e^{kx} & \text{if} \quad x < 0 \ (k > 0) \\ 0 & \text{if} \quad x > 0 \end{cases}$$

Kreyzsig (8th ed): 10.10.7 Find the Fourier transform of the following function $f(x)$ (without using Table III, Sec. 10.11). Show the details of your work.

$$f(x) = \begin{cases} xe^{-x} & \text{if} \quad x > 0 \\ 0 & \text{if} \quad x < 0 \end{cases}$$

Kreyzsig (8th ed): 10.10.10 Find the Fourier transform of the following function $f(x)$ (without using Table III, Sec. 10.11). Show the details of your work.

$$f(x) = \begin{cases} |x| & \text{if} \quad -1 < x < 1 \\ 0 & \text{otherwise} \end{cases}$$