

제목 없음

노트북: SW
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$$f(x) = e^{-2x} \quad (x > 0)$$

$$A_w = \frac{1}{\pi} \int_{-\infty}^{\infty} f(x) \cos(wx) dx$$

$$= \frac{1}{\pi} \int_0^{\infty} e^{-2x} \cos(wx) dx$$

$$= \frac{1}{\pi} \frac{w}{2^2 + w^2}$$

$$B_w = \frac{1}{\pi} \int_{-\infty}^{\infty} f(x) \sin(wx) dx$$

$$= \frac{1}{\pi} \int_0^{\infty} e^{-2x} \sin(wx) dx$$

$$= \frac{1}{\pi} \frac{2}{2^2 + w^2}$$

$$\therefore f(x) = \int_0^{\infty} \frac{1}{\pi} \frac{w}{2^2 + w^2} \cos(wx) + \frac{1}{\pi} \frac{2}{2^2 + w^2} \sin(wx) dw$$

$$e^{-2x} = \frac{2}{\pi} \int_0^{\infty} \frac{w \cos(wx)}{2^2 + w^2} dw$$

$$\int_0^{\infty} \frac{dw}{2^2 + w^2} \cos(wx) dx = \frac{\pi}{2} e^{-2x}$$

$$e^{-2x} = \frac{2}{\pi} \int_0^{\infty} \frac{1}{2^2 + w^2} \sin(wx) dw$$

$$\int_0^{\infty} \frac{1}{2^2 + w^2} \sin(wx) dw = \frac{\pi}{4} e^{-2x}$$

반복하기 하기 때문에 2로 나눠야함!

Fourier Transform

$$A_w = \frac{1}{\pi} \int_{-\infty}^{\infty} f(p) \cos(wp) dp$$

$$= \frac{1}{\pi} \left[\int_{-\infty}^0 0 + \int_0^1 \cos(wp) dp + \int_1^{\infty} 0 \right]$$

$$= \frac{1}{\pi} \frac{1}{w} [\sin(wp)]_0^1$$

$$= \frac{1}{\pi w} \sin(w)$$

$$B_w = \frac{1}{\pi} \int_{-\infty}^{\infty} f(p) \sin(wp) dp$$

$$= \frac{1}{\pi} \int_{-\infty}^0 0 + \int_0^1 \sin(wp) dp + \int_1^{\infty} 0$$

$$= \frac{1}{\pi} \left[-\frac{1}{w} \cos(wp) \right]_0^1$$

$$= -\frac{1}{\pi w} (\cos(w)) + \frac{1}{\pi w}$$

$$\therefore f(x) = \int_0^{\infty} \frac{1}{w\pi} \sin(w) \cos(wp) - \frac{1}{w\pi} \cos(w) \sin(wp) + \frac{1}{w\pi} \sin(wp) dw$$

$$\frac{1}{w\pi} \sin(w - wp)$$

$$e^{i(a-b)} = \cos(a-b) + i \sin(a-b)$$

$$\cos a \cos b + \sin a \sin b + i \sin a \cos b - i \cos a \sin b$$

$$e^{i(a+b)} = \cos(a+b) + i \sin(a+b) = e^{ia} e^{ib}$$

$$e^{-i(a+b)} = \cos(a+b) - i \sin(a+b) = e^{-ia} e^{-ib}$$

$$(\cos a + i \sin a) (\cos b + i \sin b)$$

$$\cos a \cos b + i \cos a \sin b + i \sin a \cos b - \sin a \sin b$$

$$(\cos a + i \sin a) (\cos b - i \sin b)$$