CT-1. Which of these operators is a linear operator?

I. $L(x) = x^2$ II. $L(x) = A \cdot \frac{d^2x}{dt^2}$

III. $L(x) = \sin(x)$ IV. $L(x) = A \cdot x + B$

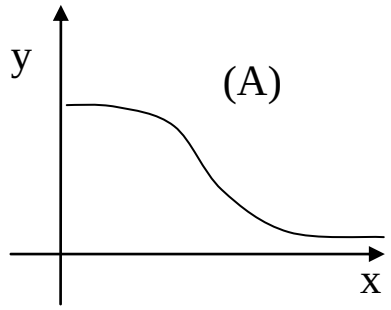
V. $L(x) = \exp(x) = e^x$

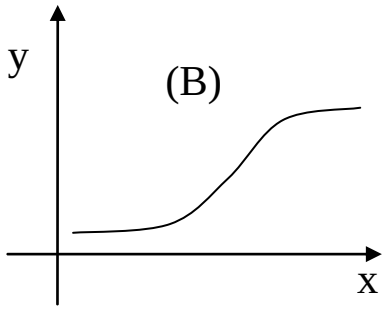
A) 1 of these **B) 2 of these** **C) 3** **D) 4**

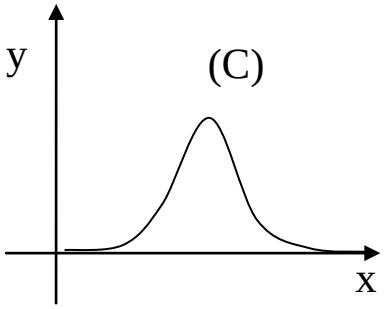
E) All 5 of these

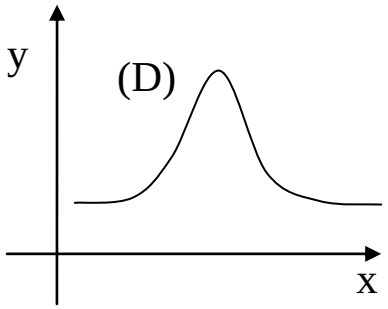
CT-2.What is the shape of the function

$$f(x) = \frac{1}{\sqrt{(x - x_o)^2 + C^2}}, \quad C > 0$$









CT-3. Consider the function $f(t) = A\exp\left(-i\,2\pi n\,\frac{t}{T}\right)$, $n \neq 0$

What can you say about the these 4 integrals?

I. $\int_{-T/2}^{+T/2} f(t)\,dt$ II. $\int_{0}^{+T} f(t)\,dt$

III. $\int_{1.5T}^{2.5T} f(t)\,dt$ IV. $\int_{511T}^{512T} f(t)\,dt$

A) All are real and non-zero

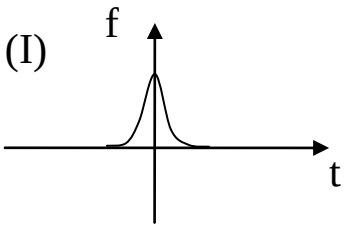
B) All are zero

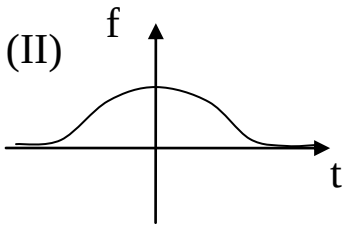
C) All are pure imaginary and non-zero

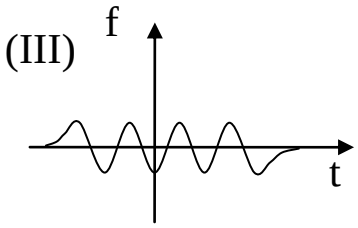
D) All are non-zero. Some are real, some are imaginary.

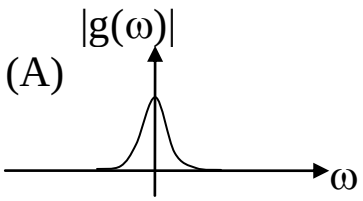
E) Some are real, some are imaginary, at least one is zero.

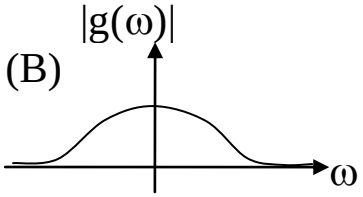
CT-4. Match the function f(t) to the magnitude of it Fourier Transform $|g(\omega)|$:

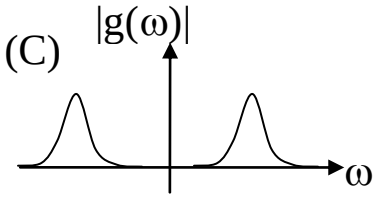


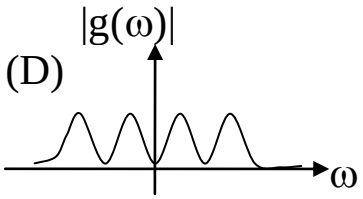












(I) has transform (A) or (B)?

(III) has transform (C) or (D)?