

# Tutorato MATEMATICA APPLICATA

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## Esercitazione 4B del 03/11/2021 *Trasformata di Fourier*

1) Eseguire i seguenti calcoli

- $\mathcal{F}^{-1} \left\{ \frac{1}{16 + k^2} \right\}$
- $\mathcal{F} \{ e^{7x} H(2 - x) \}$
- $\mathcal{F} \left\{ \frac{1}{x^2 + 4x + 5} \right\}$
- $\mathcal{F} \{ e^{-2|x-4|-3ix} \}$
- $\mathcal{F} \left\{ \frac{5x}{x^2 + 9} \right\}$
- $\mathcal{F}^{-1} \left\{ \frac{e^{-2ik}}{7 + i(6 - 2k)} \right\}$
- $\mathcal{F} \left\{ \frac{\cos(3x)}{4x^2 + 3} \right\}$

SOLUZIONE:

$$\mathcal{F}^{-1} \left\{ \frac{1}{16 + k^2} \right\} = \frac{1}{8} e^{-4|x|}$$

$$\mathcal{F} \{ e^{7x} H(2 - x) \} = \frac{e^{2(7-ik)}}{7 - ik}$$

$$\mathcal{F} \left\{ \frac{1}{x^2 + 4x + 5} \right\} = \pi e^{2ik - |k|}$$

$$\mathcal{F} \{ e^{-2|x-4|-3ix} \} = \frac{4e^{-4i(k+3)}}{4 + (k+3)^2}$$

$$\mathcal{F} \left\{ \frac{5x}{x^2 + 9} \right\} = 5\pi i \left[ e^{3k} H(-k) - e^{-3k} H(k) \right] = \begin{cases} -5\pi i e^{-3k} & k \geq 0 \\ 5\pi i e^{3k} & k < 0 \end{cases}$$

$$\mathcal{F}^{-1} \left\{ \frac{e^{-2ik}}{7 + i(6 - 2k)} \right\} = \frac{1}{2} e^{(\frac{7}{2} + 3i)(x-2)} H(2 - x)$$

$$\mathcal{F} \left\{ \frac{\cos(3x)}{4x^2 + 3} \right\} = \frac{\sqrt{3}\pi}{12} \left[ e^{-\frac{\sqrt{3}}{2}| -k+3|} + e^{-\frac{\sqrt{3}}{2}| -k-3|} \right]$$