Tutorato MATEMATICA APPLICATA

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Esercitazione 5 del 29/10/2019
Trasformate di Fourier

1) Eseguire i seguenti calcoli

- $\mathcal{F}\{e^{-2x^2}\}$
- $\mathcal{F}^{-1}\left\{\dfrac{e^{7ik}}{5+(k+1)^2}\right\}$ (Esame 29 gennaio 2019 - compito 1)
- $\mathcal{F}\left\{\dfrac{\cos(3x)}{4x^2+3}\right\}$
- $\mathcal{F}^{-1}\left\{\dfrac{e^{-2ik}}{k-7}\sin(3(k-7))\right\}$
- $\mathcal{F}\left\{\dfrac{\sin(\pi x)}{3-ix}\right\}$
- $\mathcal{F}^{-1}\left\{\dfrac{3+i(k-2)}{9+(k-2)^2}e^{-3ik}\right\}$ (Prima prova intermedia 14 novembre 2017 - compito 1)
- $\mathcal{F}^{-1}\left\{\dfrac{e^{-2ik}}{7+i(6-2k)}\right\}$

SOLUZIONE:

$$\mathcal{F}\{e^{-2x^2}\} = \sqrt{\frac{\pi}{2}}e^{-\frac{k^2}{8}}$$

$$\mathcal{F}^{-1}\left\{\frac{e^{7ik}}{5+(k+1)^2}\right\} = \frac{\sqrt{5}}{10}e^{-i(x+7)}e^{-\sqrt{5}|x+7|}$$

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

$$\mathcal{F}^{-1}\left\{\frac{e^{-2ik}}{k-7}\sin(3(k-7))\right\} = \frac{1}{2}e^{7i(x-2)}\left[H(x+1) - H(x-5)\right]$$

$$\mathcal{F}\left\{\frac{\sin(\pi x)}{3-ix}\right\} = \frac{\pi}{i}\left[e^{-3(k-\pi)}H(k-\pi) - e^{-3(k+\pi)}H(k+\pi)\right]$$

$$\mathcal{F}^{-1}\left\{\frac{3+i(k-2)}{9+(k-2)^2}e^{-3ik}\right\} = e^{(3+2i)(x-3)}H(3-x)$$

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