Tutorato MATEMATICA APPLICATA

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Trasformata di Fourier

1) Eseguire i seguenti calcoli

1. $\mathcal{F}^{-1}\left\{\dfrac{1}{k^2+4k+5}\right\}$

2. $\mathcal{F}\{e^{6x}H(2-x)\}$

3. $\mathcal{F}^{-1}\left\{\dfrac{\sin(\pi(k-7))}{(k-7)e^{2ik}}\right\}$

4. $\mathcal{F}\left\{\dfrac{4x}{x^2+9}\right\}$

5. $\mathcal{F}\{e^{-2|x-3|-4ix}\}$

6. $\mathcal{F}\left\{\dfrac{\cos(3x)}{4x^2+3}\right\}$

<u>SOLUZIONE</u>:

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

$$\mathcal{F}\{e^{6x}H(2-x)\} = \frac{e^{2(6-ik)}}{6-ik}$$

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

$$\mathcal{F}\left\{\frac{4x}{x^2+9}\right\} = 4\pi i\left[e^{3k}H(-k)-e^{-3k}H(k)\right] = \begin{cases} -4\pi i e^{-3k}, & k\geq 0 \\ 4\pi i e^{3k}, & k<0 \end{cases}$$

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

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