Metodi Matematici della Fisica
2 Dicembre 2003

Compito 1

1. $y(t) = A\ t\ e^{-3t}\ \theta(t) + \frac{1}{9} - \frac{1}{9}\ (1 + 3t - 3t_0)\ e^{-3(t-t_0)}\ \theta(t - t_0)$
2. L'integrale esiste $\forall \alpha \in \mathbf{C}/\text{Im}\ \alpha \neq 0$ e $\forall \alpha = 2k$, con $k \in \mathbf{Z}$:
   $I = \frac{2}{\alpha}\ e^{+i\alpha\pi/2}\ \sin(\alpha\pi/2)$ se Im $\alpha > 0$
   $I = \frac{2}{\alpha}\ e^{-i\alpha\pi/2}\ \sin(\alpha\pi/2)$ se Im $\alpha < 0$
   $I = 0$ se $\alpha = 2k$ con $k \neq 0$
   $I = \pi$ se $\alpha = 0$.
3. $P_0(x) = 1$, $P_1(x) = 2(x + 1)$, $P_2(x) = 3x^2 + 6x + 2$
   $f(x) = \frac{1}{3}P_2(x) - P_1(x) + \frac{1}{3}P_0(x)$.

Compito 2

1. $y(t) = A\ t\ e^{2t}\ \theta(t) + \frac{1}{4} - \frac{1}{4}\ (1 - 2t + 2t_0)\ e^{2(t-t_0)}\ \theta(t - t_0)$
2. L'integrale esiste $\forall \beta \in \mathbf{C}/\text{Im}\ \beta \neq 0$ e $\forall \beta = k + 1/2$, con $k \in \mathbf{Z}$:
   $I = +\frac{i}{\beta}\ e^{+i\beta\pi}\ \cos(\beta\pi)$ se Im $\beta > 0$
   $I = -\frac{i}{\beta}\ e^{-i\beta\pi}\ \cos(\beta\pi)$ se Im $\beta < 0$
   $I = 0$ se $\beta = k + 1/2$ con $k \in \mathbf{Z}$.
3. $P_0(x) = 1$, $P_1(x) = 2(x - 1)$, $P_2(x) = 3x^2 - 6x + 2$
   $f(x) = \frac{1}{3}P_2(x) + P_1(x) + \frac{1}{3}P_0(x)$.