[nex95] Probability distribution with no mean value

Consider the function $P_X(x) = x^{-1}e^{-x}I_1(x)$ for $0 < x < \infty$, where $I_1(x)$ is a modified Bessel function.

(a) Show that $P_X(x)$ is normalized to unity.

(b) Produce a plot of $P_X(x)$ for $0 < x < 6$.

(c) Show that a mean value $\langle x \rangle$ does not exist.

(d) Calculate the median value x_m from $\int_0^{x_m} dx\, P_X(x) = 1/2$.

Solution: