Q3a

Define $P_1(x) = \frac{1}{x^2}$, and $P_n(x) = P_{n-1}(x)\frac{1}{x^2} + p'_{n-1}(x)$. Note that $P_n(x)$ will always be a polynomial. Now, define

$$f(x) = \begin{cases} x > 0 & e^{-\frac{1}{x}} \\ x \leq 0 & 0 \end{cases}$$