4. [10 points] The lifetime t (in years) of a tree has probability density function

$$f(t) = \begin{cases} \dfrac{a}{(t+1)^p} & \text{for} \quad t \geq 0. \\ \\ 0 & \text{for} \quad t < 0. \end{cases}$$

where $a > 0$ and $p > 1$.

a. [4 points] Use the comparison method to find the values of p for which the average lifetime M is finite ($M < \infty$). Properly justify your answer.

b. [4 points] Find a formula for a in terms of p. Show all your work.

c. [2 points] Let $C(t)$ be the cumulative distribution function of $f(t)$. For a given tree, what is the practical interpretation of the expression $1 - C(30)$?