A train's arrival time at Kowloon station is T minutes past noon, where the PDF of T is

$$f_T(t) = \begin{cases} 1/(t+1)^2, & \text{if } t \geq 0 \\ 0, & \text{otherwise.} \end{cases}$$

Given that the train hasn't arrived by 12:05, what is the probability that it arrives by 12:10?

Solution: The CDF for T is

$$F_T(t) = \int_{-\infty}^{t} f_T(t) = \begin{cases} 1 - 1/(t+1), & \text{if } t \geq 0 \\ 0, & \text{otherwise.} \end{cases}$$

Therefore $\mathrm{P}(T > t) = 1 - F_T(t) = 1/(t+1)$ when $t \geq 0$. By the axioms of probability,

$$\mathrm{P}(T \leq 10 \mid T > 5) = 1 - \mathrm{P}(T > 10 \mid T > 5) = 1 - \frac{\mathrm{P}(T > 10)}{\mathrm{P}(T > 5)} = 1 - \frac{1/11}{1/6} = \frac{5}{11}.$$