

3. [13 points]

The phones offered by a cell phone company have some chance of failure after they are activated. Suppose that the density function $p(t)$ describing the time t in years that one of their phones will fail is

$$p(t) = \begin{cases} \lambda e^{-\lambda t} & \text{for } t \geq 0. \\ 0 & \text{otherwise} \end{cases}$$

- a. [5 points] Find the cumulative distribution function $P(t)$ of $p(t)$.
- b. [4 points] If the probability of a cell phone failing within a year and a half is $\frac{2}{5}$, find the value of λ .
- c. [4 points] The cell phone company offers its clients a replacement phone after two years if they sign a new contract. What is the probability that the client will not have to replace his or her phone before the company will give him or her a new one?