1) The discrete random variable X has the probability distribution (10 points)

$$f(x) = (1-\lambda)\lambda^x \quad \text{for } x = 0, 1, 2, 3, \ldots$$

Assume that $0 < \lambda < 1$. Note that your answers will be in terms of the constant λ.
a) Calculate the moment generating function of X.
b) Use the moment generating function to find the mean of X.
c) Use the moment generating function to calculate the variance of X.

2) The probability density function for X is given below (10 points)

$$f(x) = \begin{cases} \lambda e^{-\lambda x} & \text{if } x > 0 \\ 0 & \text{elsewhere} \end{cases}$$

Assume that $\lambda > 0$. Note that your answers will be in terms of the constant λ.
a) Calculate the moment generating function of X.
b) Use the moment generating function to find the mean of X.
c) Use the moment generating function to calculate the variance of X.
d) Find the variance by using the definition (and integrating by parts).