1. (5 points) Suppose that the joint density function of \((X, Y)\) is

\[ f_{X,Y}(x, y) = \begin{cases} \frac{x+y}{4} & 0 < x < y < 2 \\ 0 & \text{otherwise} \end{cases}. \]

Find the conditional density of \(X\) given that \(Y = y\), \(f_{X|Y}(x|y)\).

2. (5 points) Suppose that \(X\) is a random variable with density function

\[ f_X(x) = \begin{cases} e^{-x} & x \geq 0 \\ 0 & x < 0 \end{cases}. \]

Find the moment generating function \(M_X(t) = E[e^{tX}]\).