1. Let X_1 and X_2 be independent random variables with density functions

$$f(x) = \begin{cases} e^{-x} & \text{if } x \geq 0 \\ 0 & \text{if } x < 0 \end{cases}$$

and

$$g(x) = \begin{cases} e^{-x} & \text{if } x \geq 0 \\ 0 & \text{if } x < 0, \end{cases}$$

respectively. Compute the density function of $X_1 + X_2$.