

$$E(X) = \int_0^{\infty} x \lambda e^{-\lambda x} dx.$$

$$= \left[x \cdot (-e^{-\lambda x}) \right]_0^{\infty} + \int_0^{\infty} 1 e^{-\lambda x} dx.$$

$$= 0 - 0 + \left[-\frac{1}{\lambda} e^{-\lambda x} \right]_0^{\infty}$$

$$= 0 - -\frac{1}{\lambda} = \frac{1}{\lambda}$$