Answer the following problems. (5 points each), 60 minutes.

1- Given five devices with life-time described by the density function: $f_T(t) = \alpha e^{-\alpha t} u(t)$, $\alpha > 0$. One of them is put in service at time $t = 0$, and when it fails, it is replaced by the second device, and so on until all devices are used. Find the third moment and the variance of the combined life-time of the five devices. Assume that their individual life-times are independent random variables, and that the life-time is measured from the moment the device is put in service.

2- Assume that the length of a telephone call (in minutes) is a random variable T, with pdf

$$f_T(t) = \begin{cases} te^{-t}; t \geq 0 \\ 0; t < 0 \end{cases}.$$

The cost of a call is \$2 for the first 3 minutes, and \$6 per minute for each minute thereafter. Find:

a- $E[T]$ b- σ_T^2 c- The average cost of a call.