The grader found considerable confusion on this problem and finally gave up in reading it. Here is a solution, with some generality added. You are given a distribution (in this case an exponential distribution with parameter $\lambda$) and are asked to find the proportion of the population that exceeds the mean by more than 1 standard deviation. If $f(x)$ is the density for the distribution, that means that you are to compute

$$\int_{\mu+\sigma}^{\infty} f(x) \, dx$$

To compute this integral, we need to know $\mu$ and $\sigma$. For the distribution in question, $\mu = \lambda$. We need only compute $\sigma$. Now $\sigma^2$ for any distribution is given by

$$\sigma^2 = \int_{-\infty}^{\infty} (x - \mu)^2 f(x) \, dx$$

which by the hint in the problem is equal to

$$\sigma^2 = \int_{-\infty}^{\infty} x^2 f(x) \, dx - \mu^2$$

In the special case of this problem then we need to compute

$$\sigma^2 = \int_{0}^{\infty} x^2 \lambda e^{-\lambda x} \, dx - 1/\lambda^2$$

since $\mu = 1/\lambda$. The integral, after integrating by parts twice evaluates to $2/\lambda^2$ so $\sigma^2 = 1/\lambda^2$. Thus $\sigma = 1/\lambda$. Therefore the answer to the problem is

$$\int_{2/\lambda}^{\infty} \lambda e^{-\lambda x} \, dx$$

This is a dead easy integral to evaluate. Its value is $e^{-2}$. 

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