Solve the following problems.

1. Let $X$ be a random variable with density function

   
   \[
   f_X(x) = \begin{cases} 
   \lambda e^{-\lambda x} & x \geq 0 \\
   0 & \text{otherwise} 
   \end{cases}
   \]

   Compute $E[X]$ and $E[X^2]$.

2. Let $X$ be a random variable with density function $f_X(x) = \frac{1}{\sqrt{2\pi}} e^{-x^2/2}$. Show that

   \[
   E[X^n] = \begin{cases} 
   0 & \text{if } n \text{ is odd} \\
   (n-1)(n-3)\ldots 3 \cdot 1 & \text{if } n \text{ is even} 
   \end{cases}
   \]

3. We assume that the length of a telephone call is given by a random variable $X$ with probability density function

   
   \[
   f_X(x) = \begin{cases} 
   xe^{-x} & x \geq 0 \\
   0 & \text{otherwise} 
   \end{cases}
   \]

   The cost of a call is given as a function of the length by

   \[
   c(x) = \begin{cases} 
   2 & 0 < x \leq 3 \\
   2 + 6(x - 3) & x > 3 
   \end{cases}
   \]

   Find the average cost of a call.