1. Let $\ell_1, \ldots, \ell_k$ be some nonnegative numbers such that $\ell_1 + \cdots + \ell_k = \ell$. Find the number of weak compositions (in terms of $\ell$, $k$, and $n$) $(a_1, \ldots, a_k)$ of $n$ into $k$ such that $a_i \geq \ell_i$. 
2. Let $n$ be a natural number.

(a) Find an explicit formula for $S(n, n - 2)$.

(b) Find an explicit formula for $S(n, 3)$.
3. How many numbers must be selected from the set \([6]\) to guarantee that at least one pair of these numbers add up to 7?
4. Show that \( \int_0^{+\infty} x^n e^{-x} \, dx = n! \) for all \( n \geq 0 \).