

Name: _____

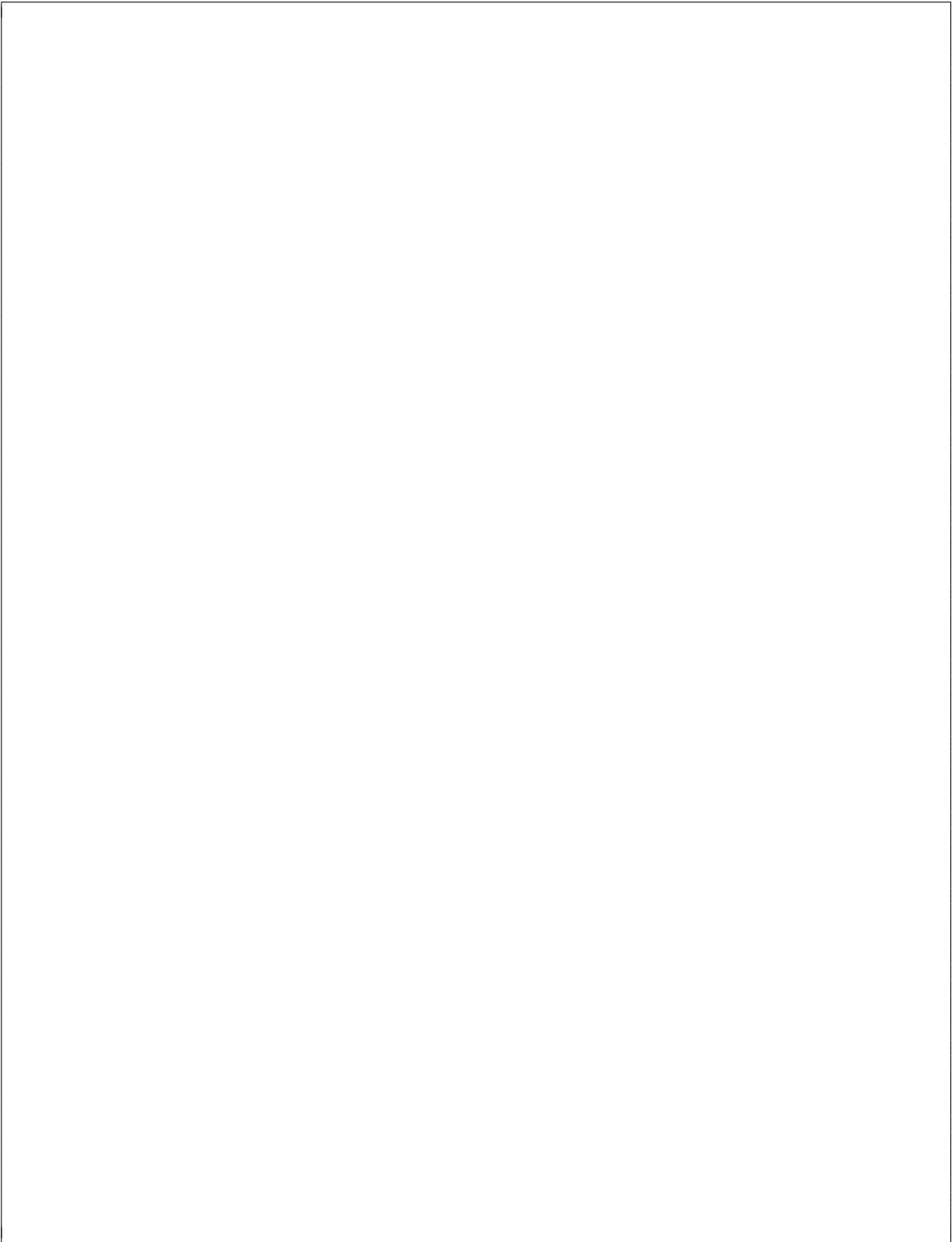
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1. (a) Find a closed formula (no summation signs) for the expression $S(n, n - 1)$.

- (b) Find a closed formula (no summation signs) for the expression $S(n, 3)$.

2. Find a closed formula (no summation signs) for the expression $\sum_{k=0}^n (-1)^k \binom{2n}{2k}$.

3. We colored all points of \mathbb{R}^2 with integer coordinates by one of six colors. Prove that there is a rectangle whose vertices are monochromatic. Can we make the statement stronger by limiting the size of the purported monochromatic rectangle?



4. Prove the following inequality for all integers n and real $x \geq -1$, $(1 + x)^n \geq 1 + nx$.