Combinatorics HW5

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Counting Derangements A derangement is a permutation of the set where no elements are fixed. We define D_n to be the number of derangements of the cannonical set $[n]$. By the inclusion-exclusion principle, we derive

$$D_n = n! \left(1 - \frac{1}{1} + \frac{1}{2!} - \frac{1}{3!} + \cdots + (-1)^n \frac{1}{n!}\right)$$

By the alternating series test, we conclude

$$D_n = \left\{\frac{n!}{e}\right\}$$