**MATH 113: DISCRETE STRUCTURES**
**WEDNESDAY WEEK 6 HANDOUT**

*Problem* 1. How many derangements $\pi$ of $\underline{n}$ have $\pi(1) = 2$ and $\pi(2) = 1$? Fix some $k$, $2 \leq k \leq n$; how many derangements $\pi$ of $\underline{n}$ have $\pi(1) = k$ and $\pi(k) = 1$?

*Problem* 2. How many derangements $\pi$ of $\underline{n}$ have $\pi(1) = 2$ and $\pi(2) \neq 1$? Fix some $k$, $2 \leq k \leq n$; how many derangements $\pi$ of $\underline{n}$ have $\pi(1) = k$ and $\pi(k) \neq 1$?

*Problem* 3. Let $D(n)$ be the number of derangements of $\underline{n}$. Use your answers to Problems 1 and 2 to find a formula for $D(n)$ in terms of $D(n-2)$ and $D(n-1)$. Determine $D(1)$ and $D(2)$ by hand and then use your formula to determine $D(n)$ for $n = 3$, $4$, $5$, and $6$; check that your answers match with the closed formula given by the inclusion-exclusion principle.