MATH 28 – HOMEWORK 5

due Wednesday, February 8

Recall the falling and rising factorial notation:

$$n^{\underline{k}} = n(n-1)\cdots(n-(k-1)) = \prod_{i=0}^{k-1}(n-i),$$
$$n^{\overline{k}} = n(n+1)\cdots(n+(k-1)) = \prod_{i=0}^{k-1}(n+i).$$

1. Consider a bookshelf with n shelves ($n \geq 3$) and k **non-identical** books. Suppose that any shelf could hold all of the books, and that the order of the books on each shelf **matters**. How many ways are there to put the books on the shelves if there must be at least three non-empty shelves at the end? You should be able to find an answer without a summation sign.

2. Consider a bookshelf with n shelves ($n \geq 3$) and k **identical** books. Suppose that any shelf could hold all of the books, and that the order of the books on each shelf **does not matter**. How many ways are there to put the books on the shelves if there must be at least three non-empty shelves at the end? You should be able to find an answer without a summation sign.