

MATH 4000/6000 Problem Set 1  
Due Thursday, August 21

*Problems to work but not turn in:*

Chapter 1, §1: 2, 3, 4c d e, 5

*Problems to turn in:*

Chapter 1, §1: 4f, 8

A. For all  $n \in \mathbb{N}$ ,  $n \geq 2$ , find a formula for

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

and prove it by induction.

B. Discover and prove a formula for

$$\binom{n}{0} + \binom{n+1}{1} + \binom{n+2}{2} + \cdots + \binom{n+k}{k}, \quad n, k \in \mathbb{N}.$$

*Challenge problems:*

Chapter 1, §1: 18, 19