

1. Prove that

$$\frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \frac{1}{3 \cdot 4} + \cdots + \frac{1}{n \cdot (n+1)} = \frac{n}{n+1}$$

2. Suppose A_1, A_2, \dots, A_n and B are sets. Prove:

$$(A_1 \cup A_2 \cup \cdots \cup A_n) \cap B = (A_1 \cap B) \cup (A_2 \cap B) \cup \cdots \cup (A_n \cap B)$$

3. Prove that $n^2 < 3^n$ for all positive integers n .

(Hint: use the fact, shown in class, that $2n + 1 \leq 3^n$ for all $n \in \mathbb{N}$)