

COSC444/541 Lecture2 Follow-up

1. (Textbook page 16, exercise 38)

Prove that for all $n \geq 4$ the inequality $2^n < n!$ holds.

Solution:

Base case: for $n = 4$, $2^4 = 16 < 4! = 24 = n!$

Inductive step:

Assume that $2^n < n!$, we need to prove $2^{(n+1)} < (n+1)!$.

$(n+1)! = (n+1)n! > (n+1)2^n$ since $n! > 2^n$.

This implies $(n+1)! > 2 \cdot 2^n$ since $(n+1) > 2$.

Therefore, $2^{(n+1)} < (n+1)!$.