Duration: **20 minutes** Aids Allowed: **NONE**

Student Number: |_|_|_|_|_|_|_|_|_|

Last (Family) Name: ____________________

First (Given) Name(s): ____________________

Tutorial Room: __________ **TA's Name:** ____________________

Prove from the definition, that $n(n+1)+4 \in \mathcal{O}(n^2)$.

Let $c = 2$
Then $c \in \mathbb{R}^+$
  Let $B = 3$
  Then $B \in \mathbb{N}$
    Let $n \in \mathbb{N}$
      Suppose $n \geq B$, so $n \geq 3$
        $n^2 \leq n^2$
        $n^2 + n^2 \leq 2n^2$
        $n^2 + n + 4 \leq 2n^2$ (Since $n^2 \geq n + 4$ when $n \geq 3$)
        $n(n+1) + 4 \leq cn^2$
      Hence $n \geq B \to n(n+1) + 4 \leq cn^2$
    Since n is an arbitrary natural number, $\forall n \in \mathbb{N}, n \geq B \to n(n+1) + 4 \leq cn^2$
  Since $B \in \mathbb{N}, \exists B \in \mathbb{N}, \forall n \in \mathbb{N}, n \geq B \to n(n+1) + 4 \leq cn^2$
Since $\exists c \in \mathbb{R}^+, \exists B \in \mathbb{N}, \forall n \in \mathbb{N}, n \geq B \to n(n+1) + 4 \leq cn^2$