

Homework 2.3.2.1 Let  $n \geq 1$  Then  $\sum_{i=1}^n i = \frac{n(n+1)}{2}$ .  
 Always / Sometimes / Never

Proof: Proof by Mathematical Induction

Base Case:  $n=1$

Show  $\sum_{i=1}^1 i = \frac{1(1+1)}{2}$

$$\begin{aligned} \sum_{i=1}^1 i \\ &= 1 \\ &= \frac{1(1+1)}{2} \end{aligned}$$

<one pt>

<arith>

QED.

Inductive Step: IH

Show  $\sum_{i=1}^{k+1} i = \frac{(k+1)(k+2)}{2}$

$\sum_{i=1}^k i = \frac{k(k+1)}{2}$  (Assume)

Proof

$$\begin{aligned} \sum_{i=1}^{k+1} i \\ &= \sum_{i=1}^k i + (k+1) \\ &= \frac{k(k+1)}{2} + \frac{2(k+1)}{2} \\ &= \frac{(k+1)(k+2)}{2} \end{aligned}$$

<Split last term>

<IH>

<arith>

QED

Hence by PMI,  $\sum_{i=1}^n i = \frac{n(n+1)}{2}$ .