

Math 2300, Spring 2019

Proofs using the Principle of Mathematical Induction

Principle of Mathematical Induction (Epp, p. 246)

Let $P(n)$ be a property that is defined for integers n , and let a be a fixed integer. Suppose the following two statements are true:

1. $P(a)$ is true.
2. For all integers $k \geq a$, if $P(k)$ is true then $P(k + 1)$ is true.

Then the statement

for all integers $n \geq a$, $P(n)$
is true.

Dr. Martin's 5 step method to prove $P(n)$ for all integers $n \geq n_0$.

1. Base Case: $P(n_0)$

If it is an equation be sure to check both sides separately.

2. Write down the Induction Hypothesis: $n=k$

Where k is a particular, but arbitrary integer greater than or equal to n_0

Let $k \in \mathbb{Z} \ni k \geq n_0$ and suppose $P(k)$

3. Write down what needs to be proved: $n = k + 1$

We must show that $P(k+1)$

4. Show $P(k)$ implies $P(k+1)$ by clear and convincing argument, usually starts:

Consider $P(k+1)$

5. Conclusion

By PMI $P(n) \forall n \in \mathbb{Z} \ni n \geq n_0$